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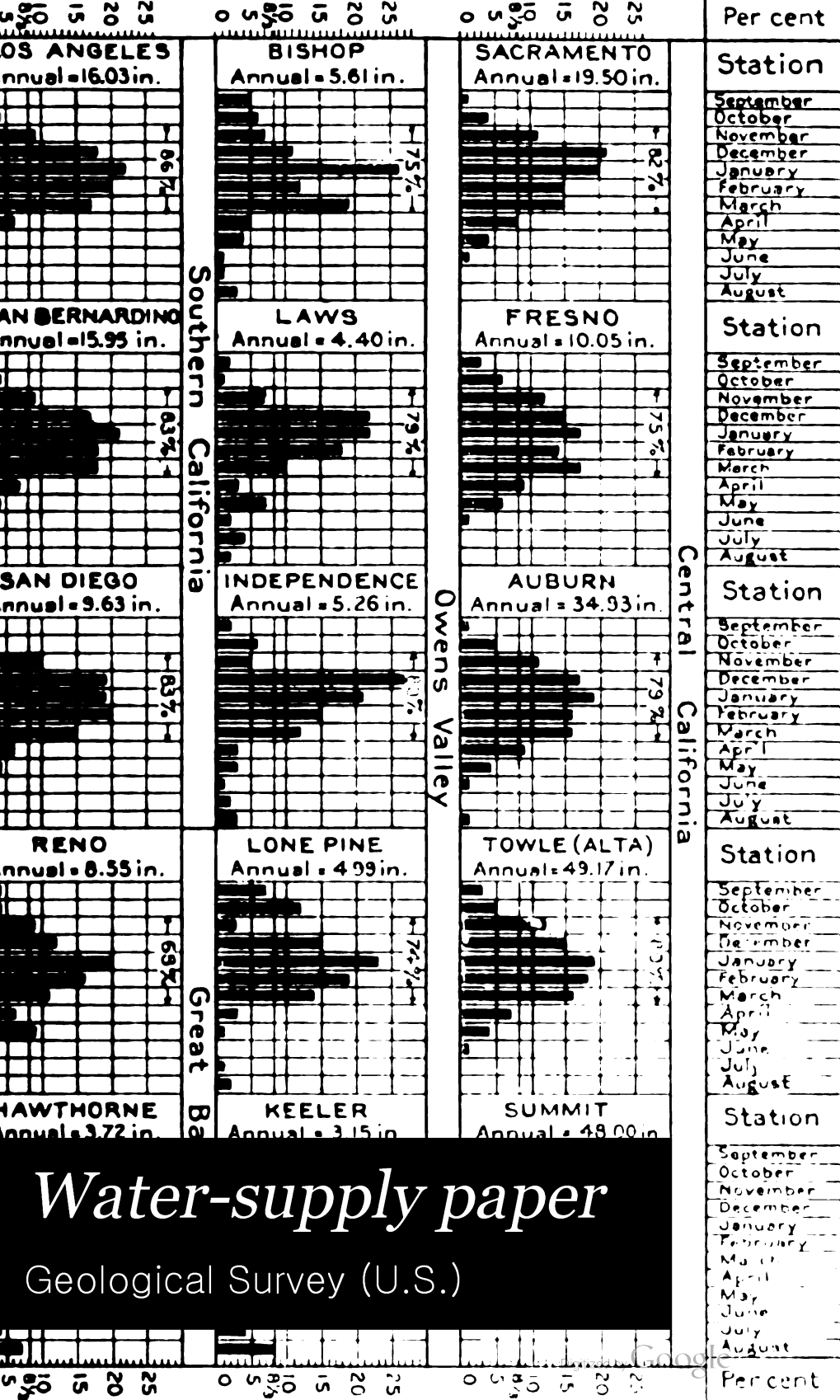

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WATER-SUPPLY PAPER 294

AN INTENSIVE STUDY

OF THE

WATER RESOURCES OF A PART OF OWENS VALLEY, CALIFORNIA

BY

CHARLES H. LEE

Prepared in cooperation with the Bureau of the Los Angeles Aqueduct and the State of California

WASHINGTON

GOVERNMENT PRINTING OFFICE

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AN INTENSIVE STUDY OF THE WATER RESOURCES OF A PART OF OWENS VALLEY, CALIFORNIA.

By Charles H. Lee.

INTRODUCTION.

This paper presents in final form the results of studies made by the Department of Public Works, Bureau of the Los Angeles Aqueduct, city of Los Angeles, in cooperation with the United States Geological Survey and the State of California, for the purpose of determining the available underground water supply of Owens Valley, Cal.

The ideal conditions in this valley for obtaining accurate and reliable data regarding ground-water sources and outlets, the comprehensive field investigations carried on, and the general applicability of the ideas and results to ground-water conditions in valleys of arid regions make this a study that should be of general interest.

Owens Valley lies in east-central California and receives its relatively abundant water supply from precipitation on the eastern slope of the Sierra Nevada. It is an inclosed basin so lined by impervious rock formations that its ground waters have practically no subterranean outlet. Farming has been practiced here for more than 40 years, but because of the isolation of the valley the principal crops raised are alfalfa, corn, and grain, which can be consumed at home by live stock. The climate is arid, and irrigation is necessary for the production of crops. Canal systems deliver on the land water from Owens River and the tributary mountain streams. The area at present irrigated is limited by the natural flow of the streams in dry years during the period of maximum irrigation draft. The city of Los Angeles plans to develop a municipal water supply from the surplus surface waters reaching the lower end of the valley and from the underground sources, which have so far remained untouched.

The investigations were carried on under the supervision of William Mulholland, chief engineer of the Los Angeles aqueduct. The writer planned and executed all field and office work, and was competently aided at various times by two to six technical assistants. Field observations extended over a period of three years—from June, 1908, to June, 1911.

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The study is based on the fact that the porous valley fill of the Owens Valley occupies an impervious undrained rock basin and that its void spaces constitute an immense underground storage reservoir. The principal source of supply of this reservoir is percolation from precipitation upon its surface, from stream channels crossing its surface, and from irrigation. The only outlets for the water in Owens Valley as a whole are afforded by evaporation from water surfaces and damp soil and by transpiration from vegetation. However, considering any isolated portion of the valley fill, the channel of Owens River provides an outlet for excess surface water which is not absorbed by the atmosphere. Owens Lake receives all such excess surface water from the river, and ultimately provides an outlet by evaporation from its expansive surface.

This paper presents and analyzes the data gathered in the Independence region, an isolated portion of the valley. The data are discussed under the following headings: Physical features of the region, precipitation, stream flow, evaporation and transpiration, percolation, ground water.

PHYSICAL FEATURES.

TOPOGRAPHY AND DRAINAGE.

Relation to adjacent territory.—Owens Valley lies along the western edge of the Great Basin, and has the general characteristics of that region, except within the tributary mountain zone to the west, where the typical features of the high Sierra prevail. It is bordered on three sides by desert regions. To the north lies the Mono basin; to the east the White, Inyo, and Coso mountains; and to the south a series of open valleys. The well-watered Sierra Nevada lies to the west, and three large rivers of the central valley of California, the San Joaquin, Kings, and Kern, have their sources along the same crest as streams tributary to Owens River. Owens Valley and its tributary mountain drainage exhibit within one hydrographic basin a very interesting combination of diverse climatic and resulting physiographic conditions. The higher levels of the Sierra Nevada receive abundant precipitation in the form of snow, whose annual variations are similar to those existing over the adjacent portion of its western slope. The remainder of Owens Valley has the characteristics of the desiccated valleys of the Great Basin, with the difference, however that portions of its floor are covered with salt-grass meadows instead of desert sands, and the lowest depression is occupied by a large saline lake instead of a salt or alkali marsh. This difference is due to the relatively abundant water supply, and should this supply be suddenly cut off the valley would soon acquire all the characteristics of the dried-up valleys or ancient lake basins of which Death Valley is a well-known type. For a clear understanding of the surface and under

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ground-water conditions in Owens Valley and their relation to climate, it is therefore of advantage to be familiar with the region west of the Sierra Nevada crest, where stream flow and precipitation records of considerable duration are available, and east of the White and Inyo mountains, where the partial desiccation exhibited in Owens Valley has advanced to completion.

Dimensions and areas.—In shape the valley is long and narrow, with a northwest-southeast trend. Its length from the Mono divide to the south end of Owens Lake is 120 miles; its width from crest to crest of the confining mountain ranges varies from 40 miles at the north end to 25 miles at Owens Lake, its minimum width being 15 miles, between Bishop and Big Pine. The total area of the valley as far south as Olancha, with its tributary mountain drainage, is about 3,300 square miles, of which 1,200 square miles is occupied by desert mountains that yield practically no run-off; 536 square miles in the Sierra Nevada yield a large run-off; and 1,580 square miles consist of transition slopes, valley floor, and the surface of Owens Lake.

A secondary range, extending from a point a few miles north of the town of Bishop to the Mono divide, separates the upper valley into two parts, the western part being known as Long Valley. A depression called Round Valley lies between Owens Valley proper and Long Valley. Owens Valley extends as far south as the south end of Owens Lake, a distance of 80 miles, and its floor ranges in width from 2 to 8 miles.

Elevations and slopes.—The elevation of the valley floor ranges from about 8,000 feet above sea level at the Mono divide to 3,570 feet at Owens Lake, the lowest point in the valley. The average slope in Long Valley is between 25 and 35 feet to the mile, and the elevation at its lower end is about 6,670 feet. From the end of Long Valley to the head of Owens Valley proper there is a drop of 2,200 feet in a distance of about 20 miles. Owens River has here cut a deep gorge through a lava sheet which extends across the valley. From the big bend in the river northeast of Bishop, at an elevation of about 4,100 feet, the slope to Owens Lake is fairly uniform and averages 7.5 feet to the mile. The average elevation of the outer borders of the valley along the base of the Sierra Nevada is about 6,000 feet and the elevation along the eastern rim ranges from 4,000 feet near Owens Lake to 6,000 feet at the base of the White Mountains. The slopes that lie transverse to the valley are steep. The eastern face of the Sierra Nevada drops off at an average rate of 1,500 to 2,000 feet to the mile, and the slopes of the alluvial deposits flanking the range vary from 250 to 600 feet to the mile. The slopes of the western faces of the White and Inyo mountains range from 700 to 2,000 feet to the mile. The valley floor has very light transverse slopes.

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The elevation of the crest of the Sierra Nevada averages 12 feet, though many peaks exceed this altitude, some of them by n than 1,500 feet. The lowest portion of the range is that exten from Mammoth Pass northward to the head of Glass Creek, the n northerly tributary of Owens River, and the highest is in the vici of Mount Whitney. The White and Inyo mountains have an ave elevation of 10,000 feet and northeast of Bishop thay attain a he of over 13,000 feet.

Drainage.—The drainage system of the valley consists of a tr stream, Owens River, fed by about 40 small tributaries enterin fairly regular intervals from the west. Water reaching the river f the east is derived from cloud-bursts, which occur at long inter and is negligible in amount. The river discharges into Owens L a saline body of water that has no outlet except by evapora The productive drainage areas of the tributary streams are the m tain canyons of the Sierra Nevada. The discharge from these can is perennial and represents true run-off, but in crossing the p alluvial formation of the valley the streams lose much water, so only a small part of this run-off reaches Owens River directly. river provides a partial outlet for underground waters, how and during low stages a large part of its flow is made up of seepag spring waters.

STRUCTURE OF THE VALLEY.

The geologic structure of the Owens Valley region has inter geologists for many years. The following summary of facts con ing the structure is abstracted from a report by W. T. Lee.[1] information presented has been verified by the writer. The val a V-shaped trough, whose bottom is filled to considerable depth unconsolidated alluvial débris carried from the steep confining m tain faces by running water. The trough was probably form faulting along the parallel planes represented by the steep eastern of the Sierra Nevada and White mountains, accompanied by ele of the eastern margins and westward tilting of the great crustal b represented by the ranges. There was probably also local fault the White Mountain block along its western face and settleme the detached block which at present lies buried beneath the fill. The western face of the trough is the granite escarpment Sierra Nevada, and the eastern face is composed of the sedim and igneous rocks of the White Mountains.

There are not a sufficient number of deep well borings to det the character of the valley fill, but in general lake and river de occupy the lower portions of the valley and coarse mountain wa

[1] Geology and water resources of Owens Valley, California: Water-Supply Paper U. S. Geo No. 181, 1906.

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upper edges, a zone of interbedded fine and coarse material lying between.

Inequalities in precipitation have resulted in marked inequality in the development of detrital cones along the bases of the parallel ranges. The cones at the base of the Sierra Nevada (Pl. II, *A*) are connected with one another, forming a continuous slope, and are of immense size, rising to a maximum elevation of 2,000 feet above the river and extending out into the valley for 3 to 7 miles; those along the White Mountains are isolated and have maximum elevations of 1,000 feet and widths of half a mile to 2 miles.

The porous nature of the valley fill and the imperviousness of the rock basin in which it lies make ideal conditions for the storage of underground water.

GROUND-WATER REGIONS.

Considering the valley fill as an immense underground storage reservoir, there are four divisions, or ground-water regions, into which the reservoir is naturally divided by topographic and geologic features. These basins and their tributary drainage areas will be designated as the Long Valley region, the Bishop-Big Pine region, the Independence region, and the Owens Lake region. They are separated by transverse ranges of hills, which partly isolate sections of the valley fill and to a large extent cut off underflow from one region to another. (See Pl. I.)

The Long Valley region includes Long Valley and the tributary drainage above the proposed dam site, and has a total area of 444 square miles. Of this area 23 per cent is the steep eastern slope of the Sierra Nevada and is productive of run-off, 16 per cent consists of desert mountains, 31 per cent is an elevated plateau with rolling hills that support a scattered growth of Jeffrey pine and are covered with a deep surface mantle of loose volcanic ash and pumice, and 30 per cent is made up of lower mountain slopes and desert valley floor. Conditions are very favorable for underground storage, as is proved by the abundance of springs and the regular flow of Owens River at the point where it leaves the valley. A lava sheet has buried the original topography between Long Valley and Owens Valley so that it is difficult to determine to what extent the underflow is cut off, but numerous springs emerging from the lower edge of the lava indicate an outlet through and beneath it.

The Bishop-Big Pine region includes an area of 609 square miles lying between Owens River and the Sierra crest and extending southward to the Poverty Hills, which extend eastward across the valley from Tinemaha Point within 1½ miles of the base of the White Mountains. The high mountains constitute 41 per cent of the area, lower mountain faces and outwash slopes 45 per cent, and valley

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floor 14 per cent, a large part of the valley being cultivated or meadow land. The surface of the valley fill is very extensively irrigated and the region is also peculiar in having a few large streams draining the adjacent Sierra instead of many small ones. The underflow past Tinemaha Point is of necessity small, because of the contracted cross-sectional area, light gradient, and fineness of the material. The desert area east of Owens River is not included in the region because of its negligible contribution to the water supply.

The Independence region extends westward from Owens River to the crest of the Sierra and southward to the Alabama Hills. The eastern base of the Alabama Hills is 3 miles from the Inyo Mountains. The underflow past the Point of the Alabamas is small, though probably greater than that past Tinemaha Point, because of the larger cross section. The underground water resources of this region are the subject of this paper, and its physical features are described in detail.

The Owens Lake region embraces the territory between Owens River, Owens Lake, and the Sierra crest and extends southward to include Olancha Creek. Its area, exclusive of the lake, is 275 square miles, of which 36 per cent consists of high mountains, 42 per cent lower mountain faces and outwash slope, and 22 per cent valley floor, only a small part of which is cultivated or meadow land. The area of Owens Lake is about 90 square miles. South of Owens Lake, at Haiwee, the bedrock cuts off any possible ground-water outlet in that direction.

Owens Valley is therefore a water-tight basin receiving its supply entirely from precipitation and disposing of it only by evaporation and transpiration. All waters not thus disposed of in the upper regions flow down the channel of Owens River to Owens Lake and there have an outlet by evaporation from the water surface.

Because of the isolation of its valley fill, its simple topographic and geologic structure, its uniform run-off features of large contiguous areas, the small extent of its irrigation, its mild winter climate, and its accessibility, the Independence region was selected at the commencement of fieldwork as the most favorable part of Owens Valley for a careful study of underground-water conditions. It has all the typical features of an underground reservoir of the arid region, developed with remarkable regularity and completeness, making it an ideal location for these investigations. For the purposes of this study its surface has been classified as high mountain drainage, intermediate mountain slopes, outwash slope, and valley floor (Table 1 and Pl. I).

The high mountain drainage (Pl. II) embraces the eastern slope of the Sierra Nevada and consists of a series of seventeen small canyons which are the productive drainage basins of streams tributary to Owens River (Table 2). These canyons are all narrow at the

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A. SIERRA NEVADA FROM INDEPENDENCE SHOWING OUTWASH SLOPE, INTERMEDIATE SLOPE, AND HIGH MOUNTAINS.

B. CREST OF SIERRA NEVADA FROM KEARSARGE PEAK.

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A. TERMINAL MORAINE IN CANYON OF SOUTH FORK OF OAK CREEK.

B. SLIDE AND MORAINAL MATERIAL IN CANYON OF NORTH FORK OF OAK CREEK.

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mouth (the 6,500-foot level) and broaden out more or less toward the summit, presenting a shape that is roughly triangular. They are separated by high knife-edge ridges, which terminate in triangular slopes facing the valley. They have been cut by water erosion and sculptured by active glaciation above the 7,500-foot level, their upper portions being well-developed glacial cirques. In many places below the cirques are series of benches occupied by glacial lakes or meadows. Cross sections of the canyons within the region of glaciation have the typical U shape, but below the 7,500-foot contour the V shape produced by water erosion prevails. Most of the cirque floors are buried beneath morainal accumulations; some of the polished canyon bottoms between the 11,500 and 8,000 foot levels are swept clean of débris; others are completely buried by morainal material. Terminal and lateral moraines of considerable size occupy the canyon floors between the 8,000 and 7,000 foot levels. (See Pl. III, *A*.) The canyon walls are encumbered by three types of rock débris—talus, slide, and decomposed rock in place—whose bases are superposed upon the morainal deposits of the canyon floors. (See Pl. III, *B*). The talus lies at the bases of cliffs in continuous slopes or cones that do not reach great height. The slides lie on steep slopes that are subject to rapid weathering and attain considerable size, in places reaching the ridge crests. The decomposed-rock mantles cover the canyon walls below the region of glaciation. In general, the morainal deposits of the cirque floors and the talus cones are composed of angular blocks with but little fine material, and the lower morainal material is a well-graded mixture of all sizes from glacial meal to large bowlders. The slides are of both types, but the mantle rock is largely fine material. The general formation is granitic but includes here and there overlying bodies of metamorphosed slates. The solid granite, although checked and disintegrated at the surface, is unfissured beneath, and is therefore impervious to water. The exposed glaciated surfaces show very little weathering. These conditions have been described in detail because of their important bearing on run-off.

The intermediate mountain slopes (Pls. II, *A*, and IV, *A*) are the triangular areas terminating the ridges between the canyons and probably represent the original face of the range before it had been actively eroded (Table 3). Their lower boundary has been arbitrarily placed at the 6,500-foot contour, and their apexes reach a maximum elevation of about 12,000 feet. They have a steep uniform slope of 2,000 to 3,000 feet to the mile and in general are covered with a mantle of disintegrated rock and slide material which merges into the valley fill.

The outwash slope (Pl. II, *A*) is the desert portion of the surface of the valley fill, extending from the 6,500-foot contour at the base of the Sierra Nevada to the upper edge of grass and irrigated land in

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the valley (3,900 to 4,000 feet). Its surface is composed of loose bowlders, gravel, and sand deposited during past ages by torrential streams coming from the mountains. This deposit is of unknown depth and lies upon a buried ancient rocky surface, the higher hills of which appear above the present surface as buttes or knolls. The channels of streams draining the mountain canyons cross this slope in trenches, which near the mountains are 25 to 50 feet deep.

The valley floor (Pl. XXX, p. 84) embraces the area between the outwash slope and Owens River, and its surface may be classified as cultivated land, grass or meadow land, alkali land, and desert. The upper edge has a maximum slope of about 120 feet to the mile, but within a short distance it merges into the practically level valley. The surface is soil to a depth of 1 to 3 feet except on the desert land, where it is fine sand. Lying beneath the surface material are thin alternating layers of clay, sand, and gravel to unknown depths. The cultivated land is largely located along the upper margin of the valley floor adjacent to the creek channels. It is described more fully below in connection with experiments on the duty of water. The grass or meadow lands lie between and to the east of the ranches and extend well out into the level valley. The growth is most luxuriant in the spring zone, which is about a quarter of a mile wide and is situated at the upper edge of the valley floor. Here are numerous small flowing springs, with temperatures of about 62°, which start the meadow grass early in the season and keep it green until late in the autumn. Farther out in the valley the salt grass makes a green carpet from May until late July, when it begins to turn yellow for lack of water. In the salt-grass land there is always a deposit of alkali about the plant roots, and the soil surface is crusted. The spring zone, however, is free from alkali. The alkali land is practically bare of vegetation and is thickly crusted with white salts. It lies in the more level areas in the center of the valley. Desert land lies between the grass land and the river. Because of its elevation above the surrounding valley and its position with respect to bluffs it is usually well subdrained. The bluff along the earthquake fault of the year 1872 and the river bluff are both at the east edge of desert zones. Along the fault line is a succession of springs, meadows, and undrained lakes which are discussed in connection with ground-water phenomena.

The desert area to the east of Owens River yields no appreciable run-off, and owing to its light precipitation, it makes no contribution to the ground water. It is of no interest to this study, therefore, except in connection with chemical analyses of its well waters.

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A. VIEW OF KEARSARGE PEAK, SHOWING INTERMEDIATE MOUNTAIN SLOPE BETWEEN OAK AND LITTLE PINE CREEKS AND LOCATION OF RAIN GAGES NOS. 10 AND 11.

B. SNOW MELTING AND DRAINING INTO SLIDE MATERIAL.

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PRECIPITATION.

GENERAL CONDITIONS.

The water which occurs within a drainage area, whether found upon the surface or underground, is in general derived from precipitation within the boundaries of the area. This is true of the Independence region, and therefore the determination of the amount and distribution of precipitation upon its surface is the first step toward obtaining knowledge of the quantity of its underground water resources. The problem is far from being a simple one, for not only is the region visited by three distinct types of storm, each of which exhibits local peculiarities, but the topography has a marked influence on the amount and distribution of precipitation. Records kept in the valley are entirely inadequate to furnish knowledge of the quantity, intensity, and distribution of precipitation in the adjacent mountains, and large differences occur even upon the valley floor. An average precipitation computed for the Independence region as a whole would thus be meaningless and lead to erroneous conclusions. It is possible, however, so to divide the area that by establishing gages at well-chosen points average values can be obtained for the several subdivisions—the method adopted in these investigations.

The following discussion of precipitation describes the sources and characteristics of Owens Valley storms, lists the various records available in the region and adjacent territory, and considers in detail the distribution of precipitation with regard to time and geographic position.

CHARACTER OF STORMS.

There are three distinct types of storm which yield precipitation over the Independence region, two of them of distant origin and widespread in extent and the third local. Both of the general types advance over the western border of the North American Continent from the Pacific Ocean, one from the north Pacific, appearing first along the coast of British Columbia, Washington, and Oregon, and the other from the south Pacific, appearing along the coast of southern California and extending over the valley of the Colorado. The local storms gather along the high crest of the Sierra Nevada and occasionally reach out over the valley or form around secondary storm centers in the Inyo Mountains.

The storms appearing from the north Pacific are those which cause precipitation over Washington, Oregon, California north of Tehachapi, and occasionally southern California and the region to the east. Their frequency and intensity in California is greatest during the rainy season, which in the extreme northern part of the State extends from October to April and in the vicinity of San Francisco from November to March. Whether the California rainy season is wet or

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dry depends upon the distance south to which these north Paci storm centers or "lows" extend. Even during a wet season few them reach the extreme south end of the State with sufficient intensity to produce rain. McAdie [1] states that not one-tenth of the north Pacific "lows" have any appreciable effect on the climate of San Diego.

The high Sierra as seen from Independence is a very sensitive indicator of approaching storms over northern and central California from September to May, inclusive. The coming of one of the north Pacific storms is at once indicated either by a dark haze gathering above and to the west of the crest line, which soon thickens and settles on the mountains, or by a thick, heavy mist rising from the western slope of the range and gradually creeping over the summit, enveloping the desert slope to a level several thousand feet below the crest. This condition lasts only a few hours if the "low" does not extend very far south, but if the storm is one of considerable intensity in central California and reaches into southern California the enveloping clouds will remain for several days and during a portion of the time will extend out over Owens Valley. In either event precipitation in the form of snow occurs on the high Sierra, ranging in amount from a few inches in depth to many feet, depending on the length of time the clouds remain and the intensity of the storm. During September, October, April, and May precipitation does not often occur from these storms beyond the base of the mountains. From November to March, however, storm clouds are likely at any time to extend out over the valley, yielding snow or rain. These storms illustrate most strikingly the effect on precipitation of elevation. They supply the major part of the precipitation in the Independence region.

The storms from the south Pacific, or "Sonoras," as they are locally known in the region of their first appearance, cause rain throughout southern California and eastward over the California desert into the Great Basin region. They are sufficiently intense to yield precipitation in Owens Valley during September and October, averaging about two a year. They cover the valley as a whole, favoring neither the Sierra nor the Inyo Range, and are characterized by many small storms which travel up the valley, often crossing from one range to the other several times. These small storms yield rain along their paths, sometimes of considerable intensity, and are often accompanied by electric phenomena. Rain-gage observations after such a storm may appear inconsistent, large readings being obtained in the paths of the storm clouds and small readings elsewhere, although usually a slight increase is noticeable from the valley toward the mountains. This type of general storm yields a

[1] McAdie, A. G., Climatology of California: Bull. U. S. Weather Bur. No. L, 1903.

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large proportion of the precipitation observed at stations along the east edge of the valley, such as Keeler, Laws, and Aqueduct gage No. 18, but a relatively smaller amount near the Sierra Nevada.

The storms of local origin are the afternoon thunder showers of the high Sierra, which occur during July and August. They are usually confined to the higher levels of the Sierra Nevada, though occasionally one will develop sufficient intensity to cause precipitation over the entire valley floor and upon the Inyo Mountains. The higher elevations of the Inyo Range seem to act as secondary storm centers toward which clouds detached from the Sierra will travel. These storms are always accompanied by electric discharges. They often gather about a mountain crest, appearing in the form of a thick black cloud, from which rain will suddenly commence to fall with such intensity as to be called a cloud-burst, filling the stream channels and washes with water and bringing destruction to everything in its path. These storms are said by old residents to have greater frequency and intensity after a dry winter and have followed that rule during the period of these investigations. Precipitation from these storms forms a greater relative part of the annual total along the eastern rim of the valley floor than on the west. Stream flow from the Sierra is augmented during their prevalence.

OBSERVATIONS IN THE INDEPENDENCE REGION.

Observations of precipitation were made in the Independence region as early as 1865, under the direction of United States Army officers stationed at Fort Independence. The record extends unbroken from September, 1866, to August, 1877, and was obtained under conditions sufficiently similar to permit its being combined with the more recent Weather Bureau record at Independence. The latter covers the periods from September, 1892, to August, 1895, and September, 1898, to August, 1910, so that in all there are 26 seasons for which precipitation records are available (Table 4). These observations were made according to the methods practiced by each organization and by men instructed and detailed for that purpose. The Weather Bureau, in fact, maintains a completely equipped meteorologic station at Independence, where continuous records of temperature, barometric pressure, wind, and sunshine and 12-hour measurements of humidity are made, in addition to the measurements of precipitation. The data can therefore be considered as reliable as the ordinarily accepted rainfall records in use by engineers. These records are the only ones available within the region, other than those gathered in the investigations for the Los Angeles aqueduct.

In connection with the aqueduct project there have been established and maintained 20 precipitation stations, distributed system-

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atically over the accessible portion of the region. Most of this area is uninhabited and during the period of greatest precipitation in the spring, fall, and winter months, it is practically impossible to get into the higher mountains because of the depth of light, feathery snow and the rugged topography. The gages were distributed over the valley floor and outwash slopes and could be reached during one day by mounted observers stationed at points in the valley where shelter was available. After a heavy snow it took more than 12 hours continuous traveling on the longer routes, part of the time on horseback and the remainder on snowshoes, to cover even this area. The only methods by which observations can be obtained in the high Sierra are to erect shelters which can be occupied permanently by observers during the winter, or to install snow gages which will hold a season's catch. Although desirable, it was not considered necessary to obtain records of precipitation within the high mountain area, and no direct attempt was made to get them.

Two considerations determined the general location of the precipitation gages. First, they were each to be representative of a specific portion of that area of the Independence region over which it was essential to have data on precipitation; second, they were to be so arranged that a study could be made of the influence of elevation upon precipitation. In carrying out these purposes the gages were placed approximately in straight lines extending from the valley floor directly up the alluvial slopes and as nearly at right angles to the trend of the Sierra Nevada crest as was practicable. The intersections of the 500-foot contours with these lines determined the approximate vertical location of the gages. The exact locations were selected with respect to accessibility from roads or trails and the recognized requirements for good exposure. (See Pls. IV, *A*, and V, *A*.)

The location of the aqueduct gages is shown on Plate I and a description of them is given in Table 5. The following are additional notes bearing on the reliability of the records. Gage No. 1 was established near Black Rock Springs in connection with the record of evaporation from water surface at that point and was observed daily by a reliable man from a neighboring aqueduct camp. Gage No. 1-A was established at the Black Rock ranch and observed daily by the ranch foreman. Gages Nos. 2 to 6 comprise the Taboose group and were observed at the end of each general storm by an engineering field assistant. Gage No. 6-A was located on the summit of a narrow ridge, where the catch was about 30 per cent too small, as was discovered by establishing gage No. 6 near by on the unbroken slope of the mountain. Gages Nos. 18, 17, and 7 to 11 comprise the Oak group and were observed at the end of each general storm by an engineering field assistant. Gages Nos. 12 to 16 con-

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A. RAIN GAGE No. 11 AFTER A SNOWSTORM.

B. GAGING STATION ON OWENS RIVER AT CHARLIES BUTTE.

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stitute the Bairs group and were also observed after general storms. Gage No. 19 was established at the Forest Service station on Oak Creek and was observed daily by the resident ranger. The observations were carefully made and the record is reliable. Gage No. 20 was established at aqueduct power plant No. 2 on Division Creek and was observed daily by the head operator. The record is reliable.

The gage used was the ordinary 8-inch cylindrical gage of the United States Weather Bureau described in its "Instructions for cooperative observers." The funnel-shaped receiver, however, was dispensed with, so that the catch fell directly into the 8-inch cylinder. The mounted observer carried a measuring tube and cedar stick and poured the catch from the container into the smaller tube for measurement. Considerable difficulty was encountered in reducing snow to equivalent water. During the first season an attempt was made to follow the Weather Bureau instructions, but this was almost impossible under field conditions. The use during the second season of a spring balance which could be carried by the observer proved very satisfactory. The catch and container were weighed together, the weight of the container subtracted, and the depth of water computed from the cross-sectional area of the container on a basis of 62.5 pounds to the cubic foot of water. The snow catch in gages of this type is liable to considerable error, due to wind currents carrying the flakes across the mouth of the gage. The relative error was the same in all the gages, however, as the exposures were all on the open slope without the protection of trees or other obstacles, and no attempt was made to correct or obviate it. The results of the observations for the seasons 1908–9 and 1909–10 are given in Tables 6 and 7.

OBSERVATIONS IN ADJACENT AREAS.

Records which are valuable for comparison have been kept in other portions of the Owens Valley, both north and south of the Independence region. Cooperative Weather Bureau observers report from Bishop and Lone Pine and railroad agents have made observations at Laws and Keeler. (See Pl. I, p. 10, for location of these stations.) The railroad records are not as reliable as are the Government records, however, because 3-inch diameter gages were used and exposures were poorly chosen. These records cover the following seasons: Bishop, 1894–95 to 1908–9; Laws, 1883–84 to 1895–96; Keeler, 1884–85 to 1907–8; Lone Pine, 1904–5 to 1909–10. They are reproduced in Tables 8 to 11, expressed as seasonal totals for the rainfall year, September 1 to August 31.

Seasonal precipitation in Owens Valley, although derived from three types of storm, shows the predominence of the north Pacific type, which is practically the sole source of supply on the adjacent western slope of the Sierra Nevada and in the San Joaquin Valley.

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It is a reasonable assumption, therefore, that if relative seasonal variations at stations located in the areas just mentioned show a general similarity, the variations in Owens Valley and especially in the high Sierra have the same peculiarities and could be investigated from the records at stations west of the Sierra crest when local data are not available. Furthermore, a study of the relation of rainfall and run-off for the rivers draining the west slope of the Sierra Nevada is desirable for comparative purposes. Such Weather Bureau records as are available in this area are presented in Tables 12 to 17, computed for a rainfall year extending from September 1 to August 31. Values which appear inclosed in parentheses indicate that one or more months are missing in the published record; the figures given were obtained by estimating the missing quantity on the assumption that monthly variations at near-by stations are similar unless conditions indicate otherwise. Thus the record for October, 1907, is missing at Visalia. The mean of 20 observed Octobers at Visalia is 0.51 inch; the mean of the same 20 observed Octobers at Fresno is 0.64 inch. The precipitation at Fresno in October, 1907, was 69 per cent greater than the 20-month average at that point; therefore, the same ratio being assumed, the precipitation at Visalia in October, 1907, was 0.86 inch. Similar methods were used in filling in other incomplete records.

The data were drawn from Water-Supply Paper 81 of the United States Geological Survey, from monthly and annual climatological reports, and Bulletin L of the Weather Bureau, and from correspondence with the Weather Bureau and with persons having records in their possession. Where discrepancies were observed in the same record as given by different authorities, the published Weather Bureau record was used.

It will be noted by examination of Tables 12 to 17 and Plate VII (p. 28) that records at stations within or near the drainage areas of six large Sierra streams adjacent to Owens Valley have been grouped. The streams chosen are Tuolumne, Merced, Kings, Kaweah, Tule, and Kern rivers and are those for which studies of the relation of rainfall and run-off were made, the grouping being intended to assist in the computations of run-off. Many of the records are of short duration; therefore, to obtain comparable long-term mean values for all stations within each drainage area, computations were made, based on the longest record in the area. Thus four base stations are available for the Merced drainage area (Table 13)—Merced, with observations for 38 seasons; Crockers and Summerdale, with 14 each; and Yosemite, with 7. The observed 14-year mean at Summerdale is 54.90 inches. The mean for the same years at Merced is 11.30 inches and for 38 observed years 10.79 inches. The 38-year mean at Summerdale is

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52.40 inches, computed by multiplying the 14-year mean by the ratio $\frac{10.79}{11.30}$. Long-term means for the other base stations in the Merced area were computed similarly. The observed and computed means for each base station are given in the tables.

A number of records at stations distributed along two transverse sections of the Sierra Nevada are also a subject for study in this report in connection with the phenomena of precipitation in the range. The detail of these records is of no value here, however, and is omitted, the observed and computed long-term seasonal means being given in Tables 19 and 20. These groups of gages lie along the Central Pacific and Mokelumne sections shown in Plate VII and will be discussed later in this report. A few other precipitation records have also been used for various purposes, but it is not considered necessary to incorporate them here.

THE DISTRIBUTION OF PRECIPITATION IN THE INDEPENDENCE REGION.

The distribution of total precipitation with regard to time will be considered from its annual, monthly, and daily aspects. The mean annual precipitation at various stations and the departures therefrom are important as showing the average volume of water derived from this source; the extent of areas which, because of similar storm conditions, receive about the same percentage of the mean precipitation from year to year; the general variations to be expected in annual stream flow; and the variations in ground-water supplies as influenced by precipitation. A knowledge of the percentage of the mean annual precipitation falling during the several months of the year is important in determining the type of storm which predominates in certain areas, the effectiveness of precipitation as a source and regulator of stream flow, and its value as a source of underground water. Records of daily variations are also useful in determining the value of precipitation as a source of underground water. As stream flow is an important source of underground water in the Independence region, the knowledge of the time distribution of precipitation is especially important.

In general the distribution of precipitation in Owens Valley and adjacent areas is controlled by the types of storm from which it is derived. Each type has its peculiarities of annual and monthly variation, as well as distinctive characteristics for shorter periods. In general the annual yield from north Pacific storms will vary from twice to one-third the normal, 80 per cent of it occurring between November 1 and March 31 and most of the remainder in October, April, and May. Precipitation in these storms is not confined to any portion of the day and never occurs in intense local cloudbursts,

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although heavy downpours often continue for periods greater than 24 hours. The annual yield from the Sonora storms is very erratic and subject to wide variation. It favors the months of July, August, September, and October and is often characterized by local cloudbursts. The prevalence of mountain thunderstorms is also extremely variable from year to year. They ordinarily occur in the afternoon during the months of July and August and are often accompanied by cloudbursts. The time distribution of precipitation at any point in the area under consideration depends on the predominant type at that point.

The characteristics of monthly distribution for the Owens Valley and adjacent regions are shown graphically in figure 1. This shows monthly distribution as percentage of mean annual precipitation and is especially useful in determining the prevailing storm types by reason of the tendency to concentration in certain months. It is to be noted that the north Pacific type prevails almost exclusively in central California, the Sierra Nevada, and the valley of southern California. Exceptions are to be noted at San Diego, which receives precipitation to a small extent from Sonora storms and in the high Sierra, where if records were available the yield from local storms would be apparent. Great Basin stations such as Hawthorne, which are situated far enough east to be beyond the influence of the Sierra Nevada, show the prevalence of both general storm types by the uniform monthly distribution throughout the year, the precipitation during the months November to March being but 54 per cent of the annual. Stations near the Sierra, such as Reno and those in Owens Valley, are also visited by both types, but the north Pacific storms predominate, so that the typical concentration of precipitation from November 1 to March 31 is still very marked. Keeler, however, which is close to the desert, shows a more uniform distribution. It would appear, therefore, that in Owens Valley the north Pacific storms yield the bulk of precipitation but that in crossing the valley from west to east the Sonora storms become relatively more important. Study of figure 1 also shows that precipitation in Owens Valley falls largely during the winter months, when low temperatures and high humidity prevail. Conditions therefore favor the storage of water in the mountains as snow from winter to summer and also favor maximum percolation from precipitation into the porous materials underlying the valley.

Variations in mean seasonal precipitation for Owens Valley and adjacent regions are presented graphically in Plate VI and figure 2. Plate VI shows the relative amount falling in each year over several river drainage areas. It was prepared by computing for each precipitation base station listed in Tables 12 to 17 the percentage each year's rainfall bears to the long-term mean and averaging the percentages for all stations included in each drainage area. The latter

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process is justified by the close agreement of percentages for all stations in each drainage area. The assumption that these percentages apply to the upper portions of the drainage areas where records are not available is justified by figure 2, showing the general agreement of percentages at stations along the Southern Pacific Railroad from Sacramento, Cal., to Reno, Nev. In general, Plate VI shows that similar storm conditions exist over the west slope of the Sierra Nevada, the San Joaquin Valley, and southern California,

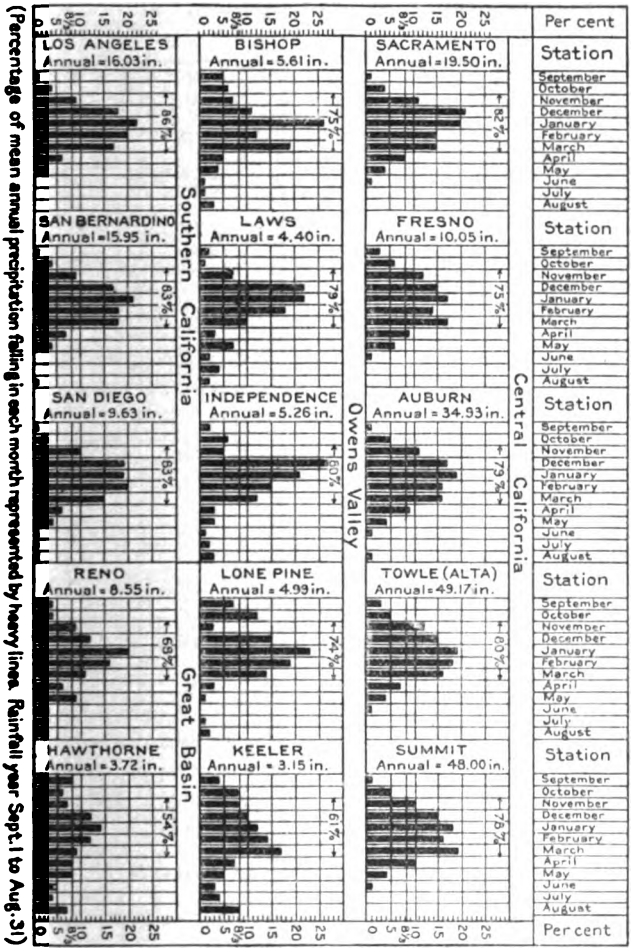

FIGURE 1.—Monthly distribution of precipitation in Owens Valley and adjacent areas.

(Percentage of mean annual precipitation falling in each month represented by heavy lines. Rainfall year Sept. 1 to Aug. 31)

as the percentages for any given year have a general similarity. There is a noticeable tendency, however, for years which are normal or below normal in central California to be progressively drier toward the south, as is illustrated by the two series of dry seasons, 1880–1883 and 1897–1900. Protracted shortages in precipitation do not exceed three years in length, and, except in the notably dry period of 1897 to 1900 in southern California, do not include years of very severe

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drought. Such years occur singly, and north of the Tehachapi Mountains there has been but one such year during the 40 years of record. In southern California, however, there have been seven years of severe drought within 38 years, six of which occurred in the eleven seasons, 1893–94 to 1903–4, inclusive. Great secular variations and very severe run-off shortages are therefore to be expected in this region.

Annual variations at Owens Valley stations are not in close agreement with those of either central or southern California, and a glance

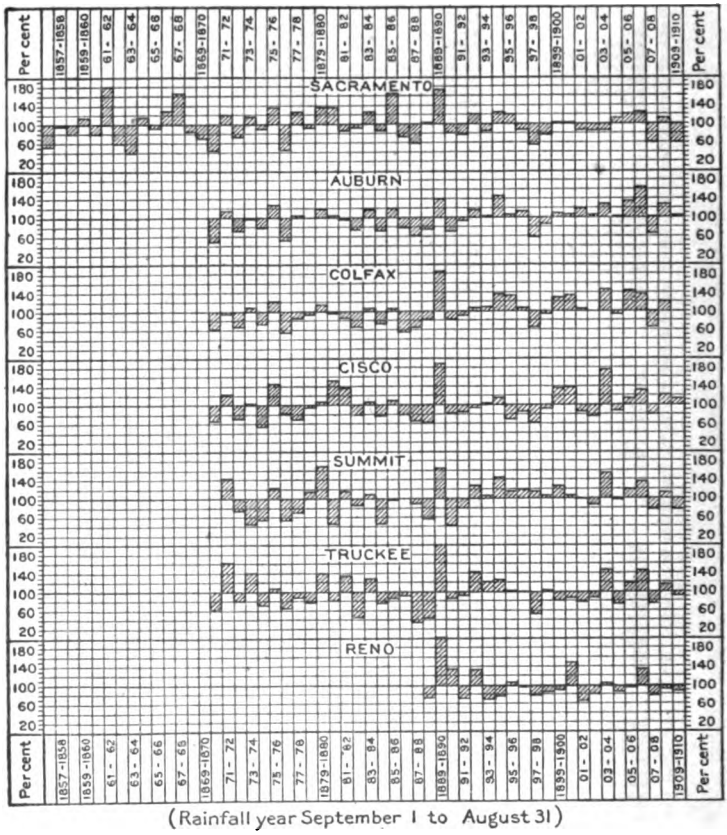

FIGURE 2.—Variation in seasonal precipitation at stations on Southern Pacific Railroad between Sacramento and Reno.

at Table 18 will show that there is not complete agreement among the individual base stations. The reason for this is the position of the stations in the valley where total precipitation is small, and where storm types other than the north Pacific have greater relative importance. It is very probable that mountain stations located east of the Sierra Nevada crest would show variations similar to those for Kings and Merced rivers, for seasonal variations in flow of

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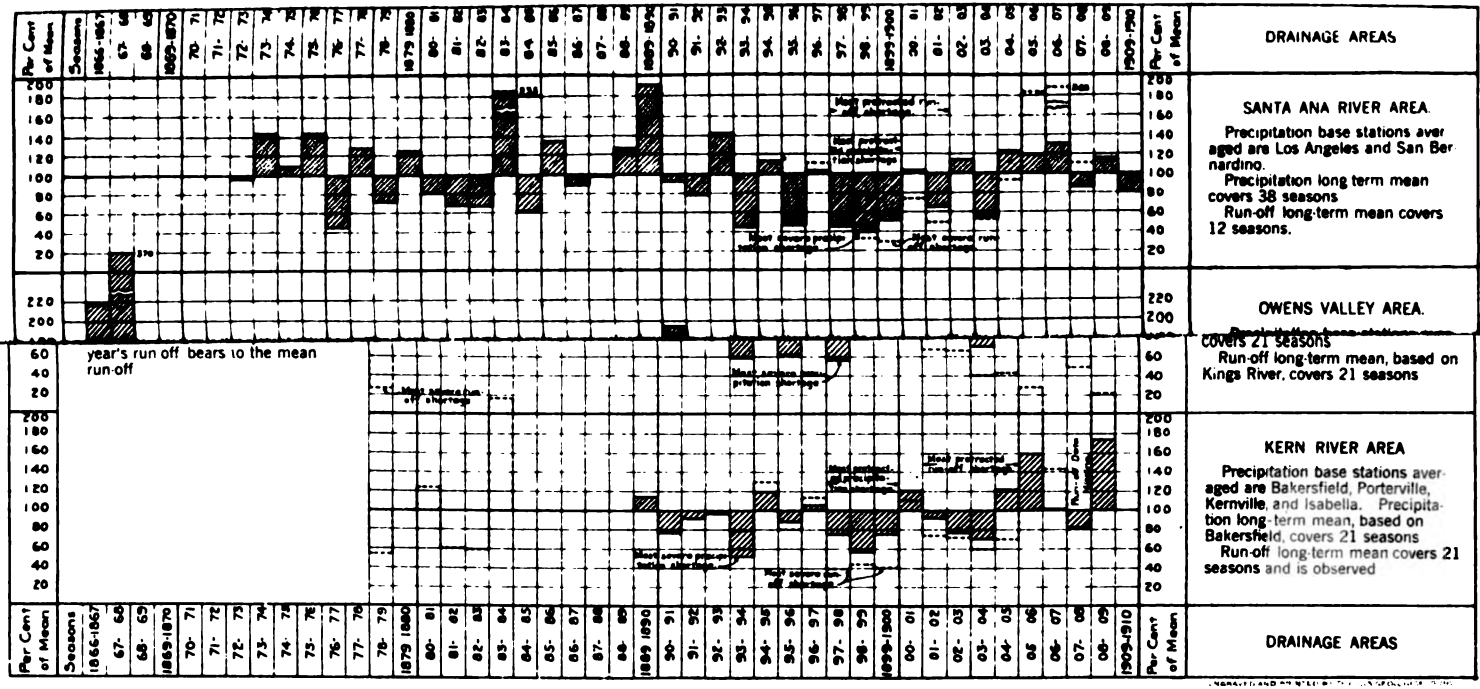

VARIATION IN SEASONAL PRECIPITATION AND RUN-OFF EXPRESSED AS PERCENTAGE OF COMPUTED LONG-TERM MEANS FOR OWENS VALLEY

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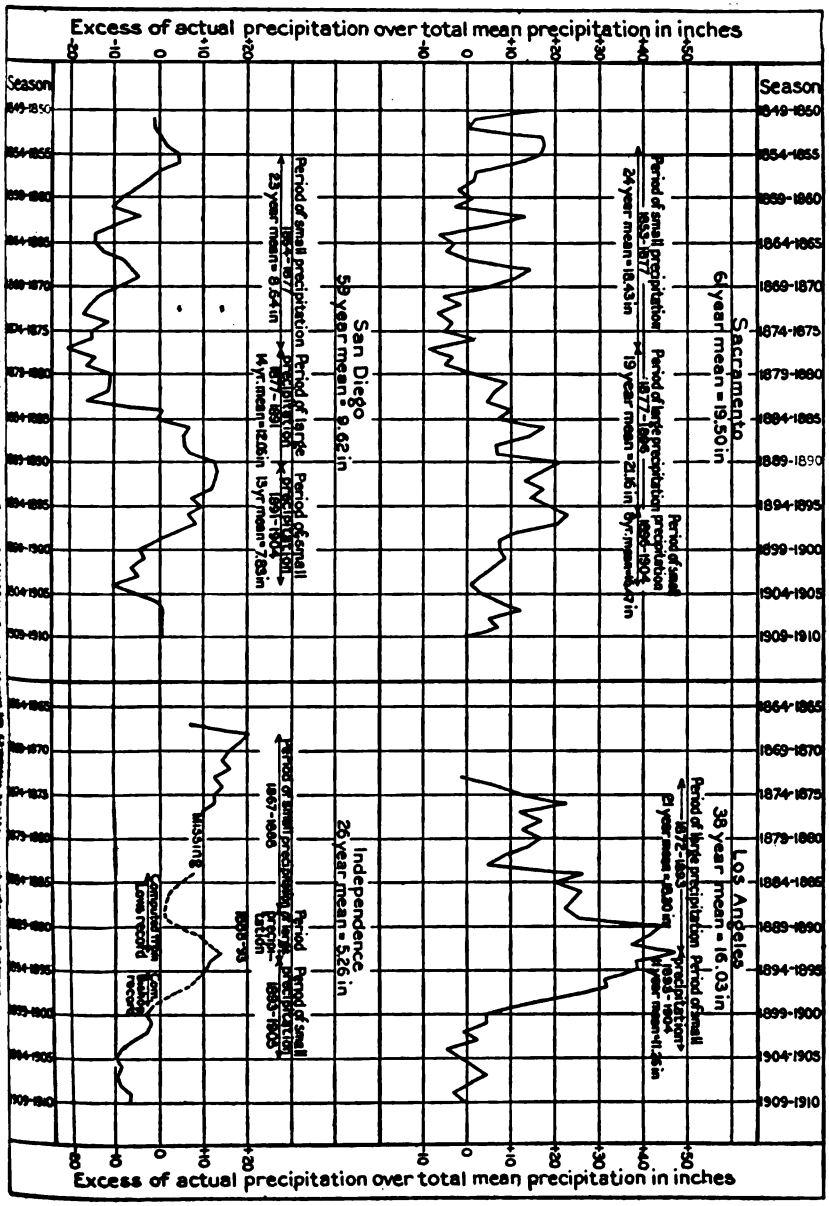
Independence region creeks agree very closely with those of Kings River. Variations over the floor of Owens Valley may be said to agree in a general way with those in southern California, the tenden-



cies observed in the latter region being in the former developed into prominent characteristics. The percentages in Table 18 are to be considered as applying to only the valley portion of Owens Valley,

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the tributary mountain drainage areas of the Sierra Nevada having the annual variation observed for the adjacent west slope of the range. It will be noted from Plate VI that Owens Valley stations are subject to extended periods of drought, the longest one covering seven years and including the driest year on record. The annual variations are extreme, ranging from 350 to 20 per cent of the mean. Therefore, should it be found that direct percolation from precipitation is the principal source of ground water for the Independence region, large annual fluctuations in the ground-water surface would be expected, while if percolation from streams was the most effective source the fluctuations would be small.

The residual mass curves presented in figure 3 for Sacramento, San Diego, Los Angeles, and Independence are useful in studying secular variations in precipitation, for they indicate tendencies covering periods of many years. Spear's description [1] of the construction of such curves is as follows:

> The ordinate of any point on these curves represents the excess of the total actual precipitation, from the beginning of the period considered to the given time, over the total that would have fallen during the same period had the precipitation occurred at a rate equal to the mean precipitation from the beginning to the end of the whole period that is considered.

In a region where ground water is replenished solely by percolation from precipitation these diagrams are very instructive, as fluctuations of the ground-water surface represent the cumulative effect of precipitation for many years. In general, over central and southern California there was a period of small precipitation from 1853 to 1877 and a period of large precipitation from 1877 to the early nineties, followed by a period of drought extending to 1904. The Los Angeles record, being of shorter duration than those of Sacramento and San Diego, does not agree exactly as to critical years, but shows similar general tendencies. Both Los Angeles and San Diego began to experience the dry period of the later nineties earlier than Sacramento. From the diagram it appears that Sacramento has received 6 per cent less than the 61-year mean for a period of 24 years and 14 per cent less for 8 years; San Diego has received 10 per cent less than a 59-year mean for 23 years and 19 per cent less for 13 years; and Los Angeles has received 30 per cent less than a 38-year mean for a period of 11 years. The secular variations in central California are therefore not as extreme as in southern California, and in the latter region they appear to be greater inland than on the coast. The Independence record is so broken that it is of little value except to show a general similarity to conditions at Los Angeles. Secular variations in the Sierra Nevada correspond in general with those observed at Sacramento.

[1] Spear, W. E., Study of the water-supply sources of Long Island: Rept. Comm. Additional Water Supply, New York, 1903, App. 7, p. 753.

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GEOGRAPHIC DISTRIBUTION OF PRECIPITATION.

The distribution of total precipitation with respect to geographic location in the Independence region and adjacent areas depends to a great extent on topographic features, notably mountain ranges and valleys, although a consistent variation is also evident with changes in latitude. The controlling topographic feature is the Sierra Nevada, which has a general northwest and southeast trend, and lies between the San Joaquin and Owens valleys. A zone of maximum precipitation exists on the western slope of the Sierra between the 4,000 and 6,000 foot levels. There is a marked decrease west of this zone toward the San Joaquin Valley and a slight decrease eastward toward the Sierra crest, beyond which there is a very marked decrease to the general level of the Great Basin, of which Owens Valley is a part. The change of precipitation with latitude is exhibited by a persistent decrease from north to south over the whole area, mountain, and valley alike.

In order to present these various features comprehensively, a map of the Sierra Nevada, including Owens Valley and adjacent territory, has been prepared, upon which have been platted isohyetal lines, or lines connecting points that have equal annual precipitation. (See Pl. VII.) The first attempt to construct such lines for extensive areas in California was made in 1886 by C. E. Grunsky, under the direction of the State engineer, William Ham. Hall.[1] In 1900, with longer and many additional records available, the California Water and Forest Association published a map of the State upon which isohyets were platted under the direction of Marsden Manson.[2] Since then no general revision for the State has been made, but in 1908 Edwin Duryea, jr., amended portions of the Water and Forest Association isohyets, after careful studies made over the drainage areas of streams draining the west slope of the Sierra Nevada between American and Kings rivers. The writer has certain additional revisions to propose, based on recent records available in the Kaweah, Tule, and Kern drainage areas and observations by the Bureau of the Los Angeles Aqueduct in Owens Valley. The Water and Forest Association isohyets as amended by Duryea appear on Plate VII as solid lines, and revisions proposed by the writer are represented by dotted lines. The geographic distribution of precipitation as thus presented on Plate VII covers the Sierra Nevada and adjacent valley from Lake Tahoe to the Mohave Desert.

The relation of precipitation and topography is exhibited most strikingly by studying observations made along cross sections of the Sierra Nevada laid out at right angles to the trend of the range. Two

[1] Irrigation development, pt. 2, Irrigation in California, 1886.
[2] Lippincott, J. B., California hydrography: Water-Supply Paper U. S. Geol. Survey No. 81, 1903.

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such sections made near elevated stations are indicated on P as the Central Pacific and Mokelumne sections. In Tables 1 will be found listed the stations chosen in each section, their el distance from Great Valley station in miles, length of observe observed and computed long-term annual mean precipitati station upon whose record computed long-term means ar The computed long-term means represent periods of 40 year Central Pacific group of gages and 28 years for the Mokelumn The computations of the means were made in a similar way described in connection with base-station records for draina and give values that are more strictly comparable than the o means. In the Central Pacific group Sacramento, Newcast Hill, Reno (1888–89 to 1909–10), and Wadsworth (189 1909–10)[1] are Weather Bureau stations. The others are ma by the Southern Pacific Railroad. The railroad stations are e with 3-inch gages, and observations are made by station ag reported to William Hood, chief engineer. All the station Mokelumne group are maintained by the Weather Bureau.

The relations of precipitation, altitude, topographic positi profiles of ground surface are shown graphically for the two g diagrams 1 to 6 on Plate VIII by platting the values pres Tables 19 and 20. The marked similarity in the curves for sections indicates that the amount of precipitation at poi transverse section of the range conforms to some general law. tion is obviously not the controlling factor, for above the 5, level the precipitation decreases with increase in altitude. T of the ground surface appears to be the most important ele volved, as is seen from Plate VIII, diagrams 2, 3, 5, and 6. T nomenon is rather complex, however, and has been recogn meteorologists only during recent years. Briefly, it results f condensation of aqueous vapor due to adiabatic cooling of m moist air driven up the slope of a mountain range by the pr winds. The region of maximum precipitation is at the low limit on the windward slope of the range, and above this th heat liberated by condensation raises the temperature above point, resulting in decreased precipitation. After crossing t mit of a high range the descending mass of air contracts in thereby raising the temperature rapidly above the dew point sulting in marked decrease of precipitation.

The phenomenon was first observed by S. A. Hill[2] in studyi fall in the northwest Himalayas of India, and he developed region the empirical formula $R = 1 + 1.92h - 0.40h^2 + 0.02h^3$, in represents the amount of rain and h the relative height in units

[1] Station removed to Fernley in 1907.

[2] Lippincott, J. B., op. cit., p. 354.

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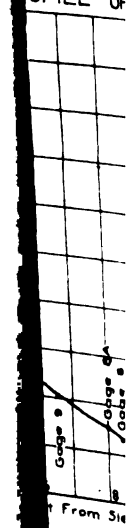

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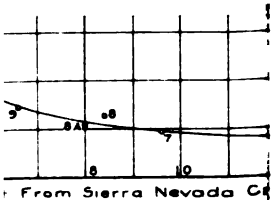

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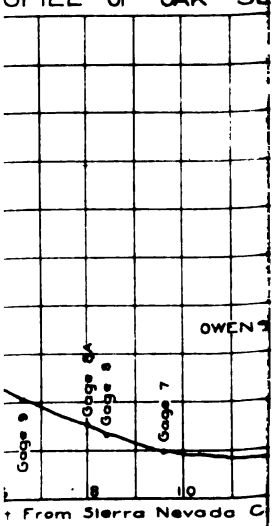

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1,000 feet above an assumed plane which is itself 1,000 feet above sea level. This equation, when platted, gives a curve very similar to that shown in diagrams 1 and 4 of Plate VIII, the plane of maximum rainfall being 4,160 feet above sea level. The equation does not apply to conditions on the leeward slope of a range, however, to judge by the discontinuity at the crest line shown on the Sierra Nevada curves. F. Pockels has investigated the subject theoretically and concludes that there is a zone of maximum precipitation on the windward slope of a mountain range and that the inclination of the earth's surface is of more importance in determining precipitation than absolute elevation.[1] His theoretical curves correspond in form with those shown in diagrams 2 and 5 of Plate VIII. The straight-line relation between precipitation and elevation often assumed in engineering computations has a very limited use and is at best a rough approximation.

A knowledge of the conditions of precipitation on the leeward or eastern slope of the Sierra Nevada is the goal of the foregoing general discussion. In addition to the two Sierra Nevada sections already mentioned records are available for parts of three others which cross the Independence region and are indicated on Plates I, VII, and VIII as the Taboose, Oak, and Bairs sections. The stations in these groups were maintained by the Los Angeles Aqueduct, as previously described. The elevations and distances of the gages from the Sierra crest will be found in Table 5 and the observed precipitation for the seasons 1908–9 and 1909–10 in Tables 6 and 7. In Table 21 are computed values for the mean seasonal precipitation at each gage based on a 26-year record at Independence. The expansion of a 2-year record into a 26-year mean is a recognized weakness in these studies, but it gives the best estimates available from the data at hand, and the results are uniform and consistent, as will appear by an inspection of diagrams 7 to 15 of Plate VIII. The similarity of all the curves is very marked, not only for the Owens Valley sections but for the Central Pacific and Mokelumne sections.

The upper points on the Owens Valley curves need some explanation. As already noted, it was not practicable to make observations of precipitation above the 6,500-foot level. An attempt has been made, however, to arrive at an approximate value for precipitation at the Sierra crest by computations based on measured stream flow. The data available for these computations were the true run-off from mountain canyons and studies of the relation of rainfall to run-off on the west slope of the range. These data are presented and discussed in the section on stream flow (pp. 31–48). It will be sufficient here to state that the mean seasonal discharge to the square mile of the drain-

[1] Monthly Weather Review, U. S. Weather Bur., 1901, p. 153.

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age areas cut by the Taboose and Oak sections is 1.75 second-feet and of those cut by the Bairs section 1.36 second-feet; the run-off factor for Kings River, which is adjacent to these areas on the west, is 0.59. By basing computations on a run-off factor of 0.75, the average precipitation over the drainage areas cut by the Taboose and Oak sections is found to be 31.7 inches in depth, and over the Bairs section areas 24.6 inches in depth. An inspection of Plate I shows that in general outline many of these areas are isosceles triangles with apexes up the canyon mouths and bases lying along the Sierra crest. Assuming a uniform rate of change of precipitation from crest to canyon mouth, as indicated by the observations in the Central Pacific and Mokelumne sections, we find that the average precipitation over a whole area equals the actual precipitation at a point, measuring from the crest, one-third of the distance from the crest to the mouth of the canyon. The observed precipitation at the canyon mouth being available, it is a matter of simple proportion to compute that at the crest. The values resulting therefrom, 40.8 inches for the Taboose and Oak sections and 32.7 inches for the Bairs section, are platted as the upper points on the diagrams, and they appear to be reasonably consistent with the observed values.

Precipitation in the Independence region is therefore primarily dependent on topography, for consistent and similar variation is to be observed with both altitude and slope of ground surface. The relation of precipitation and altitude seems to be constant from the Sierra crest to the 5,000-foot contour, and the decrease in precipitation ranges from 0.47 inch for each 100-foot drop in altitude along the Taboose section to 0.34 inch along the Bairs section. Below the 5,000-foot level the precipitation decreases less rapidly with decrease in altitude. Furthermore, precipitation and slope of ground surface exhibit similar characteristics with regard to horizontal distance from the Sierra crest, a very rapid decrease occurring in the first 3 or 4 miles, followed by a consistently less rapid decrease beyond this point out into the valley. In general, precipitation from Independence northward is about 41 inches along the Sierra crest, decreasing to about 14 inches at the base of the mountains (6,500-foot level) and to 5 or 6 inches at the upper edge of the grassland. South of Independence it is 33 inches at the crest, 9 inches at the base of the mountains, and 3 or 4 inches at the upper edge of the grassland. East of Independence there is a precipitation of about 3 inches at Owens River.

The relation of precipitation and latitude, though readily apparent, is not of sufficient importance here to be discussed at length. It results from the decrease in intensity of the north Pacific storms as they travel southward down the coast. The isohyets on Plate VII show the relation quantitatively for Owens Valley and adjacent areas.

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SUMMARY.

Precipitation has very unequal distribution over the Independence region, the average ranging from 3 or 4 inches a year at Owens River to 30 or 40 inches along the Sierra crest.

The total amount of water falling on a definite subdivision of the region during a normal year may be computed from the diagrams on Plate VIII.

In the valley the extreme range of departure for single seasons is from more than 350 per cent to 20 per cent of the normal, and over periods of 12 years the average may be 35 per cent below the normal.

In the high mountain areas the range is from twice to one-third the normal, and periods of three years may occur when the average will be 30 per cent below the normal.

The monthly distribution of precipitation is favorable to maximum percolation from the intermediate mountain and outwash slopes and to maximum snow storage in the mountains.

STREAM FLOW.

SOURCES.

Precipitation upon a drainage area is initially disposed of in three ways—by flowing directly into surface streams, by evaporation into the atmosphere, and by percolation into the ground. There may subsequently, however, be a change from surface to underground water, or vice versa, by such processes as percolation from stream channels and escape of ground water in springs. There may also be losses from streams and lakes by evaporation, and from underground water by transpiration and evaporation from damp soil.

The general sources of stream flow in the Independence region are direct surface run-off and springs. For Owens River, in particular, there should also be included the residual surface water which reaches it from tributary drainage areas. No direct measurements of any of these sources were available at the commencement of the investigations. The stream-gaging work carried on by the United States Geological Survey in Owens Valley since 1903 was planned for the purpose of determining the amount of water available for irrigation diversion. Its scope and the location of the gaging stations did not conform to the requirements of this study, which made it necessary to carry on considerable additional stream-gaging work to supply the data lacking. The field methods employed were those practiced by the Geological Survey, an acoustic meter being used for small streams and a small Price meter for ordinary work.

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SURFACE RUN-OFF.

CHARACTERISTICS.

The portion of the precipitation which finds its way directly into stream channels as surface run-off varies widely, depending largely on the porosity and depth of superficial material overlying bedrock. The bare, impervious granite surfaces of the Sierra Nevada yield a maximum run-off and the porous gravel of the outwash slopes a minimum; the clay soils of the valley floor are between these extremes. The four general subdivisions of the region are each consistent in their run-off characteristics and will be considered separately.

The clay soils of the valley floor occasionally yield a small run-off during and following winter precipitations of 1 inch or more in 24 hours, or warm rain falling upon old snow. Frost does not enter the ground uniformly, nor to sufficient depth to prevent natural percolation. This water gathers and passes off into Owens River within a few hours by way of four waste channels. It usually carries in solution much alkali which has been leached from the surface of the soil, and by contact with vegetation it acquires a dark-brown color. Inspection of Tables 46 and 47 shows that during 1909 and 1910 the surface run-off from precipitation amounted to 4 second-feet continuous flow. Such conditions usually occur every second year, so that the average total run-off from precipitation on the valley floor is about 2 second-feet continuous flow.

The outwash slopes yield no appreciable surface run-off, on account of the porous gravel formation and the great depth to ground water. This fact has been established by repeated observations during and after rainstorms and thaws, including the storm of December 31, 1909, and January 1, 1910, and is confirmed by the noticeable absence of recent drainage channels or washes, except those of streams that derive their water from high mountain drainage areas.

The intermediate mountain slopes yield a small run-off during the months of May and June, when the temperature at that level is sufficient to melt the accumulated winter snow, but the small streams do not advance far over the outwash slopes before they are entirely absorbed. If the precipitation of the preceding winter is below normal the snow melts before the hot weather comes and is absorbed at once. (See Pl. IV, *B*, p. 14.) If precipitation for the year is normal or above normal, the run-off of three of these areas reaches adjacent living streams, namely, Charlies Canyon between North and South forks of Oak Creek, Lime Fork of Little Pine Creek, and North Fork of Symmes Creek. This results from the shallow depth of the loose material overlying bedrock across which these small streams flow when they leave the mountains. Springs are common along the lower borders of these slopes, the source being the melted

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snow absorbed by the porous material above and brought to the surface where it comes into contact with impervious formations. In only a few places does such water find its way into living streams.

The high mountain drainage areas have an abundant run-off, and perennial streams flow from all but one of them, that one being Dry Canyon, between Goodale and Division creeks. The source of this water is precipitation in the form of snow and rain which falls within the drainage areas and to a small extent snow dust carried over the summits by the prevailing west and northwest winds of winter and spring. For all practical purposes the average discharge at the mouth of the canyon represents the average precipitation within the drainage area minus losses by evaporation from exposed snow surfaces. This statement assumes that the gain through windblown snow balances the loss by evaporation of water from summer rainstorms. The underflow from these areas is negligible.

Stream discharge is at a minimum from September to April. The flow during these months is remarkably uniform and is entirely uninfluenced by the current storms, though 70 to 80 per cent of the annual precipitation occurs between November 1 and March 31. The low-water flow is derived from springs and from the slow melting of the snow layer exposed to the earth's latent heat. Streams are usually frozen over by November, and as late as April they flow nearly to the mouths of the canyons in tunnels under the snow. Absolute minimum flows occur in December, in the absence of early snow; otherwise in January or February. Between April 1 and 20 air temperatures increase sufficiently to melt the snow at lower elevations and the streams begin to rise. There is an increase in air temperatures and stream flow from this date until the maximum flood crest is reached, some time between June 15 and July 15, depending on the amount of snow to be melted. Stream flow then decreases until some time in September, after which low water prevails. About 70 per cent of the annual run-off of the streams from Oak Creek to Lone Pine Creek, inclusive, occurs during May, June, July, and August. Goodale and Taboose creeks, however, are more regular in flow, only 56 per cent of their run-off occurring during this period. Stream gagings at the mouths of canyons are not available, so that the values of maximum, minimum, and mean discharges and the run-off were obtained indirectly as outlined in the following pages.

PERCOLATION FROM STREAM CHANNELS.

The United States Geological Survey gaging stations on streams draining the high mountain areas are located at the lower edges of the outwash slopes, just above the division boxes which apportion the water for use on the ranches of the valley floor. After leaving

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its canyon each stream traverses several miles of channel before reaching the gaging station, and preliminary observations in June, 1908, showed that considerable water (in some streams 50 per cent) disappeared between the two points. It was therefore necessary either to establish regular gaging stations at the canyon mouths and depend on records for short periods or to devise some means of computing the true discharge of the high mountain areas from the existing Government records, which extended over a number of years. The latter method was chosen and the results have proved very satisfactory.

The loss from these stream channels occurs as percolation into the porous formations, direct evaporation from water surface, and transpiration from vegetation growing along the stream borders. Evaporation and transpiration losses are so small, however, that they can not be detected in current-meter work. Many of the streams are completely arched with vegetation, but by assuming open conditions and basing calculations on maximum observed pan-evaporation losses at noonday the maximum evaporation loss on the largest stream studied was calculated as one-half of 1 per cent of the discharge at the canyon mouth during the high-water season and 1½ per cent during low water. The transpiration loss on this stream probably does not exceed this amount, as vegetation covers only a narrow fringe along each bank and consists mostly of small birch trees. The maximum combined loss, therefore, does not exceed 5 per cent of the total flow from the mouth of the canyon; moreover, the maximum occurs during a few days only and then during less than 6 hours out of the 24. Current-meter work in rough mountain streams, even with the exercise of the greatest care, is subject to errors as great as 5 per cent.[1] The problem therefore resolved itself into a study of percolation from stream channels, as the expense of installing and maintaining weirs was prohibitive.

There are three factors to be considered in a study of this subject—the rate of percolation, the area through which percolation occurs (the wetted perimeter), and the period of time during which a given unit of water is exposed (velocity of flow). The rate of percolation depends on (1) the character of the channel lining and the medium surrounding the channel as regards size of pores and porosity; (2) the pressure gradient, depending on the difference in level of the surface of the water in the channel and the ground-water surface; and (3) the temperature of the water. The effects of these factors on the rate of percolation are too obvious to need explanation, although Table 22 is instructive in showing the relation of temperature and percolation.

[1] Hoyt, J. C., and Grover, N. C., River discharge, New York, 1907, pp. 102-104.

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The effect of an increase in the wetted perimeter, other conditions being the same, is obviously to increase the percolation, but such change is accompanied by a proportionally larger increase in the velocity of flow, which reduces the time of exposure of a given volume of water. The net result, considering the total flow, is therefore a proportionally smaller percolation, although this effect may be counteracted to a certain extent by the scouring of a nonporous channel lining due to the increased carrying power of the stream. The whole matter is affected by so many indeterminate conditions that a general mathematical analysis is impossible, but with these ideas in view a study was made of each channel to determine the ordinary range of temperature and discharge.

The field work consisted of making comparative current-meter measurements at upper and lower stations on each creek, giving proper allowance of time for the passage of water between the two points. The measurements were made at intervals of six weeks to two months and extended over the period from June 15, 1908, to September 15, 1909, including the high-water periods of wet and dry seasons. Although it is difficult to do very accurate meter work at high-water stages on these swift-flowing streams with rough channels, it is believed that on the whole the results are reliable. Permanent gaging stations were established at the mouth of the canyon on each creek. Estimates of the time required for the passage of water between stations were based on actual trial with aniline dye in Division Creek. The average velocity maintained by a flow of 8 second-feet over a 2.3-mile course with an average slope of 687 feet to the mile was 1.06 miles an hour. Very little fluctuation in discharge has been observed in any of the creeks between 8 a. m. and 5 p. m., even in the high-water period.

The creek channels studied are listed and described in Table 23, and their locations are shown on Plate I. The "mouth of canyon" may be described as the point where percolation commences and is usually where the stream channel passes from bedrock to the alluvial zone. Above this point the bedrock is generally covered with alluvial debris, but the percolation is negligible. Where impervious dikes bring the underflow to the surface below the mouth of the canyon, gaging stations are located just below such dikes and described as at "mouth of canyon." Elevations and distances are taken from the topographic map of the Mount Whitney quadrangle made by the United States Geological Survey, the locations of gaging stations being established by field surveys where necessary. The lava formations mentioned are sheet flows which in recent geologic time spread out over the upper slopes of the cones and in some places extended well out into the valley. They are fissured and porous and have a

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greater capacity for carrying percolating waters than the all material.

A complete list of discharge measurements, with time, date, temperature of water, is given in Table 24. It will be noted tha temperature of the water as it issues from the canyons varies: 35° to 42° in winter and from 48° to 53° in summer In winte temperature does not increase much as the water travels towar valley. After leaving the protecting cover of the snow in the can during December and January the water actually becomes co ice prevailing for several weeks. In summer there is an av increase of 10° between the mouth of canyon and the Survey sta The data embodied in Table 24 were the basis for office study.

Several methods were attempted for generalizing the results the most satisfactory was the graphic method, in which losses platted as abscissas and stream discharges as ordinates with tangular coordinates (Pl. IX). It was found that for each cha straight line expressed the relation of these two quantities from to October, inclusive. During the remaining five months the tion is not clear, but the total loss is then so small that it c obtained by inspection without affecting the accuracy of the puted discharge at mouth of canyon. Total losses are platted basis of discharge both at lower and upper stations, so that i recting the Government records to obtain true yield from high tain drainage areas the quantity desired can be obtained at o entering on the x axis the discharge at the lower or Governme tion. It is also possible at the same time to read loss in seco to the mile from the straight line below the x axis.

There are some interesting conclusions to be drawn from diagrams. In general, the amount of water percolating fr channels studied varies with the time of year and with differen nel conditions. Variation with the time of year is due to th bined effects of temperature, area of wetted perimeter, and of flow. These work more or less in harmony during April t ber, inclusive, and produce the straight-line relation of total l discharge. From November to March, inclusive, discharges practically constant, showing that variations are largely co by temperature. Discharges are then so small, however, tha of measurement are appreciable and losses by evaporatio greater weight, so that the true relation of loss and temperat not appear. A possible relation between total loss and tem is suggested by the results on Division Creek, where the disc the mouth of the canyon was practically uniform during th of study. Using as ordinates the mean air temperature at In ence for the 30 days preceding each date of measurement, w a straight line which crosses the x axis at about 35°. A line su

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by additional data might cross nearer 32°, the temperature at which water freezes and percolation becomes physically impossible.

The character of the surrounding medium was the only channel condition which noticeably affected percolation. The loss from a channel crossing fissured lava, even where the lava was covered by a thin sheet of alluvium, was 30 per cent greater than that in coarse alluvium. Many other channel conditions are probably effective, but this is the only one noted from these studies.

This discussion and the accompanying diagrams (Pl. IX) outline sufficiently the method devised for computing stream discharges from high mountain areas from the existing Government records.

RUN-OFF STUDIES IN ADJACENT DRAINAGE AREAS.

The available records of stream flow in the Independence region cover the seasons 1904–5 to 1909–10, but as the longer records both of precipitation and stream flow for the west slope of the Sierra Nevada show a preponderance of wet years during this period it would not be safe to depend entirely on these 6-year records. A possible method of arriving at a knowledge of true average conditions for streams of this region is by comparison with the streams of the adjacent west slope for which long records are available. Such a comparison would not be reliable for periods of a year or even two years, because of the relatively large ground and snow storage of creeks tributary to Owens Valley. It is justified for longer periods, however, by similarity in variation of the annual precipitation which falls on both slopes (fig. 2, p. 24). As a basis for such comparison there will be presented here data regarding the seasonal variation in flow of west-slope streams and a discussion of the relation of rainfall to run-off for these drainage areas.

The stream best adapted for such a comparison is Kings River, because of the location of its drainage area (Pl. VII) and the length of the available record of its flow. Discharge measurements of this stream have been made at Red Mountain, about 18 miles east of Sanger, Fresno County, for a period of 21 years, from November, 1878, to October, 1884, by the California State Engineering Department, and from September, 1895, to the present time by the United States Geological Survey. A summary of these measurements is given in Table 25. The discharge per square mile and the depth of run-off in inches are computed for an area of 1,742 square miles, as published by the Geological Survey, and all values are given for the run-off year September 1 to August 31. From the last column of this table it will be observed that the run-off for the period 1904–5 to 1909–10 is 18 per cent above the 21-year mean and that the season 1909–10 is very slightly below the normal.

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Other streams to the north and south of Kings River having available records of various lengths are also of interest, and mean seasonal discharges and variations from 20-year means for five such streams are presented in Table 26. Named in order from north to south these are Tuolumne, Merced, Kaweah, Tule, and Kern rivers. Computed 20-year means for Merced, Kaweah, and Tule rivers are based on the Kings River record. The progressive decrease in the discharge per square mile for each stream from north to south is to be expected from the decrease in the rainfall. The similarity of variation in run-off for different streams from year to year is marked, especially for the more northerly streams. These percentages have been platted on Plate VI, an examination of which will show the general agreement in seasonal variation of both run-off and precipitation for each drainage area. There is a tendency, however, for variations in precipitation to be exaggerated by the run-off. The extreme variations in run-off of single seasons for the six Sierra streams considered seem to be from more than half to twice the mean. The minimum run-off observed for a period of three consecutive years on Tuolumne River is 32 per cent below the normal, on Kings River 39 per cent below the normal, and on Kern River 59 per cent below the normal. It should be noted, however (see Pl. VI), that run-off records are not available during periods when most severe or most protracted shortages in precipitation have occurred except on Kern River, and that even on this stream records of precipitation are not available during periods when most severe droughts have occurred farther north. It is therefore possible that greater extremes of run-off may have been experienced on these six Sierra Nevada streams than the records indicate.

Southern California streams, of which Santa Ana River is typical, are of interest in this connection. Variations in precipitation and run-off for this stream are platted on Plate VI, from which it will be seen that run-off records are available for the most protracted and severe drought which has occurred since the season 1872–73. Precipitation ranges from a little more than twice to two-fifths of the mean; seasonal run-off varies from almost three times to about one-third of the mean, and for a period of three years the minimum has been two-fifths of the mean. There are thus greater extremes of annual run-off on this stream than on the Sierra streams, although the range of annual precipitation is no greater. This may be due to dissimilarity of drainage areas with regard to elevation, geology, and vegetation, as well as to the occurrence of a period of exceptional drought. There is little doubt, however, that the minimum seasonal run-off for Kings River is less than one-half the mean for periods of a year and possibly as low as one-half the mean for periods of three years.

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Conditions are very favorable for the natural regulation of run-off on Sierra streams tributary to Owens Valley, so that variations from the mean are probably not as great on these streams as on Kings River. The run-off for the season 1907–8, for example, averaged 45 per cent below the normal on all Sierra streams of the west slope but was only 10 per cent below the normal in Owens Valley, owing to the storage of water in snowbanks and in glacial material during the two preceding wet years. The available records are too short, however, to say with any degree of certainty what the extremes might be for this region. Periods of drought extending over three years are possible, during which the average precipitation may be 30 per cent below the normal, but the shortage in stream flow would probably not be very severe until the third year. Precipitation at Owens Valley stations does not provide a means of determining extreme conditions, as can be seen by reference to Plate VI, for the reason that the conditions of precipitation existing in northern and central California prevail over the high mountain drainage areas of Owens Valley streams, whereas Great Basin conditions strongly influence precipitation in the open valley. In general, annual variations in run-off for Owens Valley streams agree with those of Kings River, although they do not have as great extremes.

Computations of the run-off factor (ratio of run-off to total precipitation upon a drainage area) for the six Sierra streams just considered has been attempted as outlined in Table 27. In brief, the method was for each season to multiply the average precipitation in inches for each drainage area by the percentage the precipitation bore to the mean for that area and divide the measured run-off in inches by the result. The average precipitation over each drainage area was obtained from the isohyets of Plate VII, by estimating the average precipitation between them, multiplying it by the included area, and dividing the total of such products by the total area. The locations of the State Engineering Department and United States Geological Survey gaging stations are not the same on Tuolumne and Kaweah rivers. The territory drained and therefore the average precipitation differs. The seasonal percentages for precipitation are those platted on Plate VI. Measured stream flow in inches was computed from the values for seasonal discharge in second feet per square mile given in Table 26. It will be observed that Tuolumne, Kings, and Kaweah rivers have an average run-off factor of about 0.55; Merced River comes next with 0.44; and Tule and Kern rivers last with 0.39 and 0.32, respectively. Tuolumne and Kings rivers have an extreme seasonal range of 0.75 to 0.40; Kaweah River varies from 0.94 to 0.29, Merced River from 0.63 to 0.31, Tule River from 0.58 to 0.19, and Kern River from 0.50 to 0.17. Thus for the three northern streams the maximum run-off factor for

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individual seasons is twice and for the three southern streams three times the minimum, the difference in range being due to the different precipitation and physical characteristics of the drainage areas.

The run-off factor for streams of the Independence region probably corresponds more closely with that for Kings River than with those for other west-slope streams. Many conditions favor a larger factor for the drainage areas of these small streams, however, among them being their high altitude, the nonporous character of the bedrock in which they are carved, the universal occurrence of deep cirques and canyons which favor the collecting of snow in protected drifts, the snow dust carried over the Sierra crest from the west into the cirque basins by prevailing winds, and the absence of lake surfaces or much vegetation. All these characteristics tend to increase the run-off factor by decreasing losses through evaporation and percolation and increasing the available snow supply in excess of that falling as direct precipitation. It is thought that in view of these conditions a value of 0.75 is not too great for the average run-off factor for streams draining the east slope of the Sierra.

The depth of snow evaporation from these drainage areas is approximately 7.7 inches of equivalent water a year. (See p. 50.) As already stated the average run-off from drainage areas cut by the Taboose and Oak rain-gage sections is 1.75 second-feet to the square mile, or 23.8 inches in depth. If to this is added the 7.7 inches lost by evaporation, a value of 31.5 inches is obtained for the average precipitation on these areas. With a run-off factor of 0.75, an average precipitation of 31.7 inches would produce a run-off of 23.8 inches, indicating the approximate correctness of the assumed run-off factor.

RUN-OFF COMPUTATIONS FOR HIGH MOUNTAIN DRAINAGE AREAS OF INDEPENDENCE REGION.

Sufficient data have been presented regarding losses by percolation from stream channels and character with respect to normal conditions of the years for which records are available to make it possible to compute the average total yield of the high mountain drainage areas. In brief, the method was as follows: United States Geological Survey records were so corrected by use of the diagrams for percolation loss as to represent true discharge at the canyon mouths; values for the few missing seasons were estimated to give complete six-year records on all streams; and the long-term average discharge was obtained by comparison with the Kings River record.

The Geological Survey records as published[1] are reproduced in Tables 28 to 33 as monthly means, arranged by run-off seasons from

[1] Water-Supply Papers 100, 134, 177, 213, and 251.

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1904–5 to 1909–10, for creeks from Tinemaha to Lone Pine, inclusive. The estimated values are determined from occasional meter measurements and by comparison with the hydrographs of adjacent streams. Tinemaha and Lone Pine creeks are not within the boundaries of the Independence region but are included because of their instructive characteristics. The corresponding values, corrected for percolation losses and representing discharge at the canyon mouths of the various streams, are presented in Tables 34 to 39. They are obtained by entering the monthly mean discharge at Geological Survey stations on the x axis of the proper percolation loss diagram (Pl. IX), moving up parallel with the y axis to the a line, across to the b line, and down to the desired value on the x axis. For creeks where the straight lines do not apply during the winter months the average value stated on the diagram is used. Special cases arise for Division and Little Pine creeks. The discharge of the former is so uniform throughout the year that except in years when stream flow is well above the normal, temperature is the dominant element causing variation in percolation from the channel. For periods of uniform flow the temperature curve was used and for periods of variable flow other curves were used as noted in the tables. Little Pine Creek exhibited the unexpected phenomenon of increased flow between the mouth of the canyon and the Geological Survey station. This seemed to occur for a short period only, following an exceptional high-water stage of the creek, but enough measurements were obtained to determine the seepage-gain curves D and E. It is probably caused by the draining of the gravel prisms which are saturated during the high-water stage, although why this is not accomplished by percolation, as on other creeks, is not apparent. The seepage-gain curves were used on this creek for the periods following very high stages, as noted in the tables.

It will be seen that stream-flow records are not available on some creeks for the entire six seasons 1904–5 to 1909–10 and are lacking altogether for some of the smaller creeks. The determination of the total amount of surface water entering the region from high mountain drainage areas involves these missing values, and for the purpose of estimating them an analysis of available records has been made and is presented in Tables 40 to 42. The total discharge from the several drainage areas is reduced to the more comparable unit discharge per square mile; the observed 6-year means and computed 21-year means are then obtained; and finally the percentages which seasonal discharges bear to the 6 and 21 year means are computed.

A study of the discharge per square mile from the several drainage areas showed a general agreement in values, and among adjacent areas having similar exposures there was a remarkable agreement. This observation led to the classification of drainage areas indicated

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in Table 40, according to the proportion of their area above an elevation of 10,000 feet and their geographic position with respect to the Kings-Kern divide. The 10,000-foot contour is approximately the lower boundary of the open cirque floors and glacial-lake benches. A drainage area having 60 per cent or more of its area above this contour has considerable flat open country near the summit of the range and a long crest exposure, conditions both of which are favorable to large precipitation and run-off. On the other hand, a drainage area with less than 60 per cent above the 10,000-foot contour has steep upper slopes and short crest exposure, and therefore small precipitation and run-off. The Kings-Kern divide is an elevated ridge lying between Kings and Kern rivers west of the crest, which it leaves at right angles from a point about 2 miles south of the northwest corner of the Shepard Creek drainage area. (See Pl. I.) North Pacific storms in their movement southward lose much of their moisture in crossing this divide, at the expense of the Sierra Nevada to the south, and as a result there is a marked difference in precipitation and run-off north and south of the junction of the ridge with the Sierra crest. This condition is noticeable from the observations of precipitation in the Bairs section, as well as from stream flow. The four classes A, B, C, and D include all streams characterized by these various run-off conditions. Class E includes only Sawmill Creek, which for some unrecognized reason has a much smaller discharge than the streams of class C, with which it would otherwise be listed.

Six-year records are available on Taboose, Goodale, Division, Oak, Little Pine, and Lone Pine creeks, and the percentage which each season's discharge bears to the 6-year mean is given for these creeks in Table 41. Percentages for the season 1904–5, the records for which are missing for Shepard, George, Bairs, and Sawmill creeks, are assumed to correspond with those for adjacent streams. Six-year means are computed from the available records, the average ratio of mean seasonal discharge for the period 1905–6 to 1909–10 to that for the period 1904–5 to 1909–10 being accepted as 1.07. In a similar manner the 6-year mean for Symmes Creek was computed, the ratio for the period 1905–6 to 1909–10 to the 6-year period being 1.04. The values in parentheses in Table 41 were thus obtained, and the 21-year means of Table 42 were computed by dividing the 6-year means by the ratio 1.18, derived from the Kings River record.

The observed 6-year mean discharges in second-feet per square mile for streams north and south of the divide having 60 per cent or more of their drainage area above 10,000 feet is 2.06 and 1.61, respectively, and for streams with less than 60 per cent above 10,000 feet 1.39 and 1.10; but Sawmill Creek has a mean discharge of only 0.86 second-foot. The 21-year means are respectively 1.75, 1.36, 1.18,

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0.93, and 0.73 second-feet per square mile. Thus the yield per square mile from areas of class A exceeds that of Kings River, and that from areas of class B exceeds that of Kaweah River; both of these relations are to be expected. It is also to be noted that while the general variations from year to year of the creeks in the Independence region and of Kings River correspond, the former do not show as great extremes as the latter.

The streams for which records are entirely lacking are still to be considered. These are Dry Canyon and Thibaut, Pinyon, and Hogback creeks. As indicated by the name, Dry Canyon is a drainage area from which no surface flow escapes. It is, however, an area of class A, and is so small and so choked with glacial débris that there has never been sufficient water flowing from it at any time to cut out a channel. As a result the yield passes directly into the valley fill without appearing permanently upon the surface. The assumed 21-year mean seasonal discharge for this area was obtained by averaging those of Goodale and Division creeks, which lie to the north and south of it; the assumed seasonal percentages are those of Goodale Creek. For Thibaut Creek a 21-year mean of 0.55 second-foot per square mile, with Sawmill Creek percentages, was assumed. Values for the other creeks were obtained similarly.

From the values thus obtained for discharge in second-feet per square mile for all high mountain drainage areas tributary to the region for the six seasons 1904–5 to 1909–10, and from the areas in square miles embraced by each as shown in Table 2, Table 43 was prepared, giving the total seasonal discharge in second-feet from each area. Red Mountain and Tinemaha creeks, although entering the region from the mountains, discharge their waters northward into the Bishop-Big Pine region across a low saddle in the Poverty Hills barrier. Only such water as percolates from their outwash-slope channels becomes part of the ground-water supply of the Independence region. The average total contribution of surface water from the 17 mountain canyons from Taboose Creek to Hogback Creek was 153 second-feet during the 6-year period of observation and 130 second-feet during a 21-year period, which represents practically normal conditions. Table 44 presents all observed seasonal discharges at United States Geological Survey stations. It is interesting to note that only 65 per cent of the discharge leaving the mountains is available for measurement at the lower stations and that on several streams the amount is barely 50 per cent.

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SPRINGS.

The occurrence of springs in the region is due to the reappearance of water which originally fell within its boundaries as precipitation and percolated into the ground. There are in general three types of springs which give rise to surface streams—those which derive their supply from precipitation upon the intermediate mountain slopes and appear at the base of these slopes, those which derive their supply from precipitation and stream percolation and appear along the upper edge of the grassland, and those which derive their supply from precipitation on lava flows and appear at the lower borders of the flows.

The springs of the first of these types are not deep seated and represent the drainage from the superficial deposits lying upon the triangular mountain slopes between canyons. The temperature of their water is about 47° or 48° F., and the flow of many of them increases in early summer and decreases during late summer and autumn. The water from most of these springs sinks into the porous gravels of the outwash slope and need not be considered in this discussion.

Springs Nos. 1 and 2, on Division Creek, and a group of springs feeding the South Fork of Oak Creek opposite the mouth of Sardine Canyon, discharge a considerable volume of water into living streams. The springs on Division Creek are located north of the creek at the crest of the alluvial cone. No. 1 has a discharge of about 0.5 second-foot, a part of which reaches the creek. Spring No. 2 discharges 2 second-feet, most of which formerly reached the creek. Its flow is now diverted into the penstock of the aqueduct power plant on this creek. These springs were considered in making measurements of percolation and in computing the surface yield from the mountain canyon. All Geological Survey measurements on Division Creek include that portion of the flow of these springs which was not lost by percolation. The steady flow and large volume of spring No. 2 indicates a source other than precipitation upon the mountain slope above, but none has yet been recognized.

The springs at the mouth of Sardine Canyon derive most of their supply from the run-off of the drainage area, which sinks into porous gravel deposits in the lower canyon. There is also a contribution from ground storage in accumulations of slide material on the mountain face to the south of the canyon. The flow from this group varies from about 3 to 1½ second-feet and is discharged directly into the South Fork of Oak Creek. In computations of run-off these springs were assumed to represent the yield of the drainage area.

The line of springs along the upper edge of the grassland represents the intersection of the natural surface of the ground and the surface

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of ground water. The water has penetrated rather deeply into the gravel fill and issues with a temperature of about 62° F., which is 5° higher than the mean annual temperature at Independence and 1° lower than that of water flowing from artesian wells in the same location. The flow of these springs is variable, being least in late summer and greatest in early spring, with regular fluctuation between these dates evidently depending on ground-water stages within the grass area. Only during the winter months is the discharge sufficient to be the source of surface streams which flow any considerable distance, and even then there are only a few of such streams which reach Owens River. Most of the yield of these springs is lost by evaporation and transpiration. The winter discharge of individual springs varies from 0.5 second-foot down to an amount that is only enough to fill small pools of standing water from which evaporation equals the yield. The total winter discharge from all these springs is about 4 second-feet.

The springs issuing from the lava formations are unique in having uniform discharges throughout the year and a temperature of 57° F. The water is probably derived from precipitation upon the lava surface, absorbed by the porous rock, and, by reason of the peculiar formation, gathered and delivered at the lower margin of the flow. The largest of these springs is Blackrock Springs (Pl. I), situated 9 miles north of Independence. It has a discharge of 23 second-feet; which flows out across the valley floor in two sloughs, each emptying into a series of shallow lakes. From November to March, inclusive, an average flow of about 7 second-feet reaches Owens River, but during the remainder of the year all the water is lost by seepage, evaporation, and transpiration. The water is apparently discharged into the basin at the spring under a low head, for by varying the elevation of water surface 2 or 3 feet the discharge can be varied as much as 20 per cent. Variations of 5 to 10 per cent occur, depending on whether or not Division Creek is allowed to flow out into the lava above the spring. Hines Spring is situated 3 miles north of this spring, and has a continuous yield of about 4 second-feet. Approximately 1 second-foot finds its way into Owens River during the winter, but is lost during the remainder of the year. Campbell Spring is situated east of Owens River, 1 mile north of Aberdeen. It has a yield of about 0.5 second-foot, and discharges directly into the river. Upper and Lower Seeley springs are situated, respectively, just above and just below Charlies Butte and discharge directly into Owens River. The upper spring has a flow of 9.5 second-feet, which is included in measurements of Owens River at the Butte. The lower spring has a flow of 1.5 second-feet.

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OWENS RIVER.

Owens River forms the eastern boundary of the Independence region for a distance of 29 miles, although the actual length of its channel is possibly 20 per cent greater, owing to its sinuosity. It is the drainage outlet for the waste surface water of the region, including the run-off from the valley floor, the yield of springs, and a small portion of the run-off from high mountain drainage areas. In order to account for all escaping surface waters and determine the condition of the river channel with regard to seepage, daily measurements of river discharge were made near the north and south boundaries of the region, and measurements of discharge into and diversion from the river channel were made between these two points.

The upper river station is at Charlies Butte (Pl. I), a lava mound situated 3½ miles above the Los Angeles aqueduct intake. It is equipped with a cable and car and a staff gage. Observations of river stage are made daily and current-meter measurements of discharge are obtained each month. The section is fairly stable and a good station rating curve has been constructed covering the period from January, 1907, to May, 1911. The lower river station was established in June, 1908, at Mount Whitney bridge, east of Lone Pine. Observations of river stage were made daily on a staff gage spiked to one of the bridge piles. Current-meter measurements from the bridge were always unsatisfactory in high water, however, and in January, 1911, a cable station was installed 1,000 feet below the bridge. In early February, 1911, a series of measurements were made covering a high stage in the river, and from these a satisfactory station rating curve based on the gage heights at the bridge was constructed for all river stages. Mean monthly discharges at each station for the period May, 1908, to December, 1910, will be found in Tables 45 to 47.

There are four well-established channels (Pl. I) by which waste surface water reaches the river. The most northerly enters about 6 miles north of Citrus bridge and carries part of the flow of Blackrock Springs and occasional run-off from the valley floor. This is dry about seven months of the year. Another channel enters less than a mile above Citrus bridge and carries the surplus flow of Little Pine, Oak, and Sawmill creeks, a portion of the flow of Blackrock Springs, and occasional surface run-off. This is dry not more than five months of the year. South of Citrus bridge waste from Shepard Creek has an outlet into the river, and still farther south the combined waste from Bairs and George creeks enters. Both of these channels also carry occasional surface run-off. Lower Seeley Springs and Campbell Springs discharge directly into the river. Current-meter measurements of the amount of water passing through these channels were made as often as possible, and mean monthly dis-

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charges for the period May, 1908, to December, 1910, will be found in Tables 45 to 47. The Stevens ditch and the Lower and Upper East Side canals divert water from the river above Citrus bridge for irrigation, and their mean monthly flows computed from gage-height readings and current-meter measurements are also given in the tables.

Surplus creek water reaches Owens River in appreciable quantities only during the high-water season. An inspection of the tables shows that in the dry year 1908 there was no such discharge into the river; in the normal year 1910 there was about 3 second-feet during one month; and in the wet year 1909 the total discharge in June was 147 second-feet, in July 135 second-feet, and in August 11 second-feet, which is equivalent to an average daily flow during the three months of 98 second-feet, or 12 per cent of the total discharge from high mountain drainage areas during the run-off season 1908–9. Thus only a very small portion of the tributary mountain drainage ever reaches Owens River. The run-off from the valley floor and the yield of springs has already been considered.

The amount of seepage into the channel of Owens River depends entirely on the adjacent ground-water level. North of Citrus bridge the water in ordinary stages occupies a narrow trench of moderate depth which winds back and forth in a wide grassy flood plain. South of the bridge the flood plain is narrow and bluffs rise almost from the water's edge. Just north of the Alabama Hills the sand bluff recedes, and for a distance of 2 miles the flood plain is over a mile in width. This area is known as "The Island" and is subject to overflow in high river stages. South of it the channel is again closely confined between the bluffs. The ground-water level of the valley in the vicinity of the river is several feet above low-water stage but is below high-water level. Seepage losses are therefore to be expected in high-water stages and seepage gains during low water. The actual conditions are shown in the last columns of Tables 45 to 47, the positive sign indicating gain and the negative sign loss. It will be seen that during flood stages the flood plain and dry sand bluffs absorb water which during the following low-water periods drains back into the river. The 10 second-feet excess of annual loss is the result of evaporation and transpiration between Charlies Butte and Mount Whitney bridge. The source of any seepage water entering this portion of Owens River is therefore not within the region and has no relation to the local ground-water problem.

SUMMARY.

The total average surface run-off from various portions of the Independence region is 132 second-feet, of which 2 second-feet is

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derived from the valley floor and 130 second-feet from the high mountain drainage areas.

The extreme range of departure of single seasons is from about twice to one-half the average, and periods of three years are possible when the mean run-off will be 35 per cent below normal.

The run-off factor for high mountain drainage areas of the Independence region is approximately 0.75.

The average yield per square mile of high mountain areas north and south of the Kings-Kern divide which have more than 60 per cent of their area above 10,000 feet is 1.75 and 1.36 second-feet, respectively, and that of areas which have less than 60 per cent above 10,000 feet 1.18 and 0.93 second-feet.

The portion of the run-off from high mountain areas reaching Owens River does not exceed 3 second-feet continuous flow or 2½ per cent of the total.

Seepage gains by Owens River are balanced in the long run by seepage losses.

The discharge from numerous springs in various parts of the region must be considered in ground-water computations.

EVAPORATION.

CONTROLLING FACTORS.

A portion of the precipitation falling upon a drainage area returns to the atmosphere through evaporation. This not only occurs immediately after a storm but also extends over a period whose duration depends on the character of the surface and underground storage of the drainage area. The latter consideration also largely determines the proportion of the total precipitation which will be lost by evaporation from two drainage areas whose climatic conditions are similar. The process of evaporation is controlled by complicated and rapidly varying conditions, which scientific research has not yet satisfactorily analyzed and formulated. In general, however, it depends on the temperature and the quantity of moisture already in the immediately surrounding atmosphere. The latter factor depends not only on the amount of moisture in the air generally but also on the action of wind in removing accumulated water vapor from above the evaporating surface. Warm arid regions have a greater annual loss through evaporation than those which are either cool and arid or warm and humid. Of the two controlling factors probably temperature is the more important in determining the amount of evaporation, but over short periods wind may have a relatively greater influence. Owens Valley, although characterized by aridity, has a temperature somewhat modified by the proximity of the elevated Sierra Nevada, and evaporation in the valley is in general less than in the desert areas to the east and south but greater than in the more humid San Joaquin Valley.

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Evaporation may occur from water as it lies in the form of snow or ice, from free water surfaces, from bare ground, and indirectly from the soil by transpiration through vegetation. All these avenues for the passage of water as vapor from the earth's surface into the atmosphere are present in Owens Valley. An extensive snow-covered area exists in the higher mountains from December until June or July; mountain lakes and streams, Owens River, small lakes and flooded areas in the valley floor, and especially Owens Lake furnish free water surfaces; and the whole ground surface at various times is in a moist condition favorable for the process of evaporation.

EVAPORATION FROM SNOW.

Evaporation from snow occurs, not alone from the general snow surface, but also from the particles of snow dust that during the late winter and spring months are carried by the fierce winds from exposed ridges and northwest slopes and collect in drifts in the shelter of canyons or cirques. The only observations which are known to have been made under conditions at all similar to those prevailing on the east slope of the Sierra were made by the Arrowhead Reservoir Co. at Little Bear Valley, in the San Bernardino Mountains, at an elevation of about 5,100 feet, in the drainage area of Santa Ana River.[1] An ordinary 8-inch cylindrical rain gage was filled with snow, either by exposure during a storm or by inverting it and pressing it down into the snow as it lay on the ground. It was then adjusted on a stand so that the general snow surface was several inches above the cylinder rim and the space between the cylinder and the surrounding snow was filled. By means of a false bottom the snow level in the cylinder was raised to the general level and kept there constantly. The evaporation was obtained by removing and weighing the cylinder and contents every 24 hours. (See Table 48.) From the results it is seen that the average depth of equivalent water which evaporated from the snow surface daily during the month of March was 0.10 inch. This figure is probably too large to represent evaporation from the Sierra snow fields, for they lie at greater elevations and do not completely cover the surface on account of the rugged topography. The effect of altitude upon evaporation from water is well shown in figure 4, prepared from the results of observations by the Office of Experiment Stations, United States Department of Agriculture, on the eastern slope of Mount Whitney.[2] The rate decreases rapidly from the valley floor at 4,000 feet elevation to 10,000 feet but very slowly above that level. The snow lies on the Sierra as far down as 7,000 feet from December to April or May and above

[1] Nineteenth Ann. Rept. U. S. Geol. Survey, pt. 4, 1898, p. 620.
[2] Eng. News, Sept. 19, 1907, p. 305.

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10,000 feet from December to June. Figure 4 shows that th evaporation from water from the 7,000-foot to the 10,000- is 73 per cent of that at 5,100 feet, and from 10,000 to 1 64 per cent of that at 5,100 feet. The areas between these bear the ratio of 4 to 5, that above 10,000 feet being the lar average evaporation from water over the whole area is 68 per cent of that at 5,100 feet. On the assumptions th 5,100-foot level in Owens Valley evaporation from snow is that observed at Little Bear Valley, and that evaporat water and from snow vary similarly with altitude, the aver

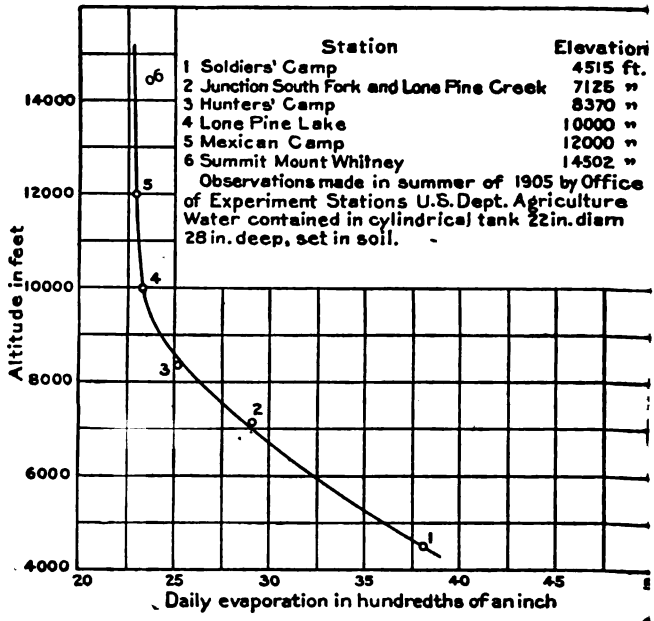

FIGURE 4.—Influence of altitude on evaporation on the east slope of Mount Whit

evaporation rate during March from the Sierra snow fields 0.068 inch for unbroken covering, and, say, 75 per cent of thi inch, under actual conditions. The average evaporation r water in the Owens Valley during the period December 1 t is about 25 per cent less than that in March, and during t December 1 to June 15 about 10 per cent less. The average equivalent water lost by evaporation from the snow fields o mountain areas would thus amount to 7.7 inches a seas figure, though not accepted as correct, is yet very useful in c with studies of stream-flow data.

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EVAPORATION FROM WATER SURFACE.

In the course of these investigations measurement of evaporation m free water surface has been made under three conditions—from pan floating in a body of water, from a pan placed in the soil, and m a deep tank placed in the soil. The first two were designed to nish data regarding evaporation from reservoir surfaces and from as of shallow flood water, respectively. The third was desired purposes of comparison with records of evaporation from soil. he pans, which were of the pattern used by the Reclamation Service, re 3 feet square and 10 inches deep and were made of sheet galnized iron. Observations were made by replacing the amount aporated with a cup whose capacity was equal to a depth of 0.01 ch in the pan. The initial height of the water surface was such that a n projecting from the center of the pan and remaining at a fixed ight, 2 inches below the rim, was just submerged. The deep tank s circular, 3½ feet in diameter and 4 feet deep, and observations re made in a stilling well with a hook gage and vernier scale readg to 0.01 inch. The records were all kept near Independence, and bservations were made every second day in summer and every urth day in winter.

The record for the pan in water is available from August 4, 1908, June 1, 1911, with four intervals of a few days each when the pan ted away. The pan was at first located in Blackrock Slough, but s moved to its final location in Owens River at Citrus bridge May 1909. (See Pl. XI, *A*.) Another pan that had been placed at rus bridge March 4, 1909, was then removed and used elsewhere. e pan was supported by a timber float which protected it from shing water. The depth of water beneath the pan varied from 1 feet, depending on the river stage. The river water had a mode velocity and varied in temperature from about 75° F. in sum to about 40° F. in winter. The river banks averaged 4 feet high ve the water surface and the pan was situated about 30 feet from m. Rain gage No. 18 was located 100 feet away on the river bank was observed in connection with the evaporation record.

he detail of the record for the pan in water is presented graphically Plate X, and Table 49 summarizes the results by months. The al depth of evaporation is about 67 inches, 75 per cent of which rs between April and September. The difference between the oration in summer (April to September) and that in winter (Octo to March) is about 33 inches. The data presented on Plate X are uctive as regards the effect of temperature, wind movement, and tive humidity on evaporation. The coincidence of the annual imum temperature, extreme dryness of atmosphere, and maxin rate of evaporation is striking, as is also the immediate change

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in the rate of evaporation brought about by a windstorm, period of dampness, or hot weather. The most important factor controlling evaporation is evidently temperature. The meteorologic observations were made by the Weather Bureau at Independence, 4 miles west of the evaporation pan, but the general conditions are very similar at the two places.

The record for the pan in soil is broken. It extends from August 1, 1909, to November 30, 1909, and from March 14, 1910, to June 1, 1911. The pan was located in the valley floor at the soil evaporation experiment station about 3 miles east of Independence. It is set in a shallow excavation, and soil is banked up to about half the depth of the pan. (See Pl. XI, *B*.) Water temperatures range from 95° F. in summer to 32° in winter. The surface temperature is about 1° warmer than that for the mixed contents of the pan. Rain gage No. 17 is located 40 feet southwest. Table 50 summarizes the results by months for this pan, and by comparing it month by month with the evaporation from the pan in water an average excess of about 33 per cent is observed. This is probably due to the warmer temperature of the water in the pan in soil during the hours of sunlight.

The deep-tank record extends unbroken from April 16, 1909, to June 1, 1911. The tank is located at the soil evaporation experiment station and is set in the soil with the upper rim flush with the surface. (See Pl. XII, *A*.) The water surface was not allowed to fall more than 4 inches below the rim. The temperature of the surface water varied from 80° in the heat of summer to freezing in winter. Except during freezing weather the average temperature of the contents of the tank was 5° less than that of the surface layer. The presence of the surrounding soil makes the range in temperature less than that for the shallow pan. The record, which is presented in Table 51, indicates an annual depth of evaporation slightly greater than that from the pan in water at Citrus bridge. The monthly distribution is more uniform, there being 70 per cent of the total during the six summer months and a difference of 27 inches between summer and winter evaporation. The effect on evaporation of the modified temperature extremes of the soil is well shown by comparison with the record for the pan in water (Table 49). Temperature conditions for the deep tank agree so closely with those of the surrounding soil that this record may be considered as representing the maximum rate of evaporation from soil.

No other extended series of measurements of evaporation from water have been made in Owens Valley. The Reclamation Service established a standard pan in one of the large irrigation ditches near Bishop and kept a record from January to October, 1904, inclusive. The total evaporation was 55 inches during the ten months, and would probably have been 60 inches for the year. The average tem-

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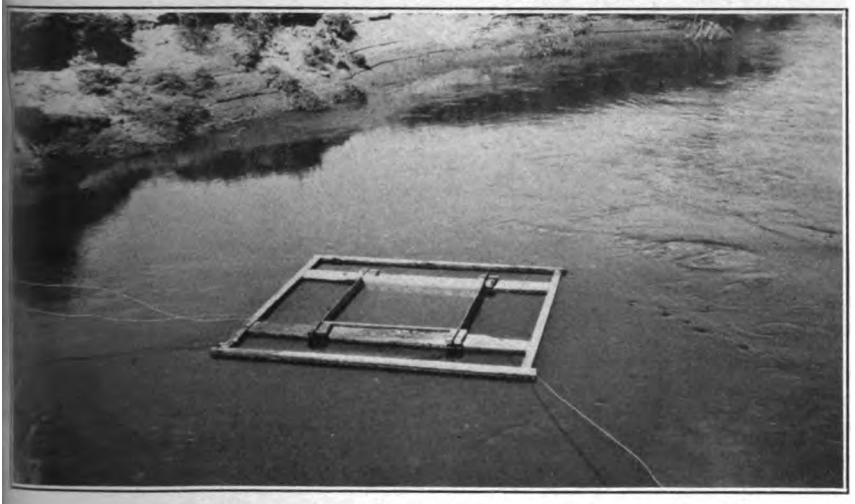
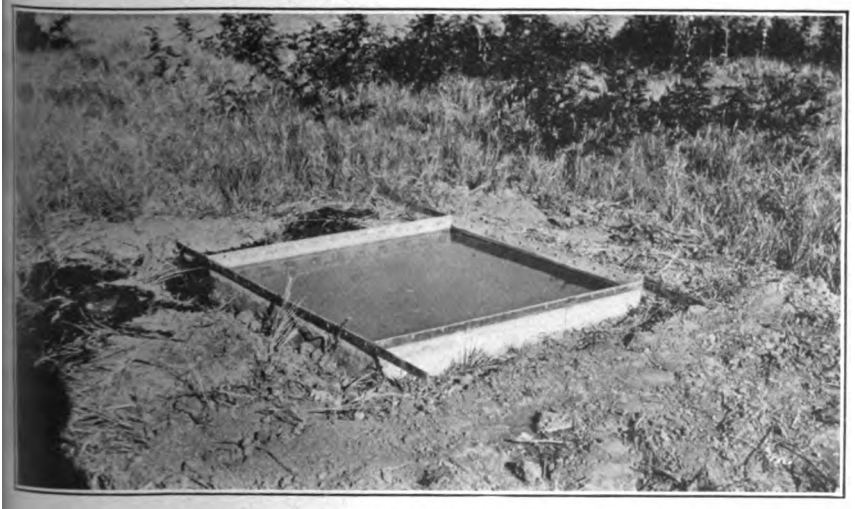


A. EVAPORATION PAN ON OWENS RIVER NEAR CITRUS BRIDGE.



B. EVAPORATION PAN IN SOIL.

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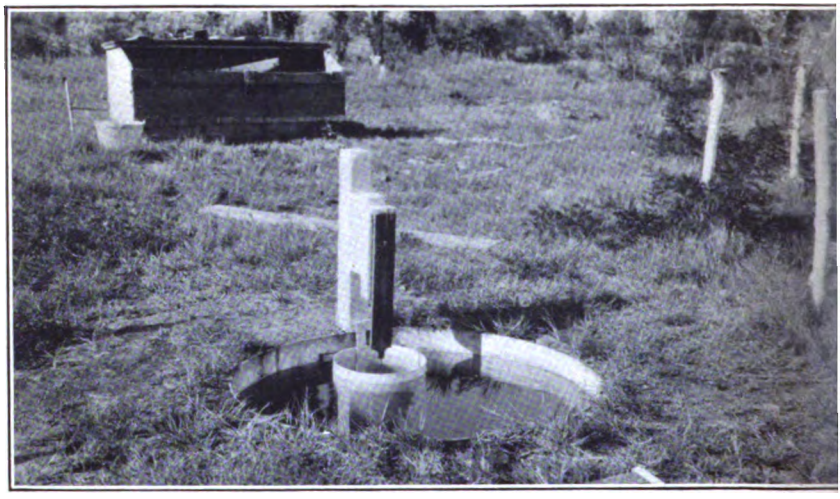

A. DEEP WATER EVAPORATION TANK.

B. SOIL EVAPORATION TANK SET, BEFORE INSTALLATION.

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perature at Bishop is about 4° lower than at Independence, so this difference in evaporation is to be expected. The annual evaporation from the surface of Owens Lake is approximately 80 inches, as computed from fluctuations in the lake surface and the Government record of stream inflow.[1] The temperature is considerably higher at the lake than at Independence.

EVAPORATION FROM GROUND SURFACE.

Water in the surface layers of the ground is subject to evaporation, either directly from the soil or through vegetation by the process of transpiration. It is available for evaporation in Owens Valley under two conditions—temporarily following a rainstorm or sudden thaw and permanently within areas where the average depth to ground water does not exceed 8 feet. The total evaporation under the first condition is relatively unimportant because of the infrequency of storms and the small amount of precipitation, and no attempt was made to measure it. Under the second condition, however, evaporation is rather large, for not only is soil capillarity able to draw gravity water (see pp. 64–65) to the surface, but roots of vegetation, such as wild grass, penetrate the soil to ground water and become the channels by which a large amount of moisture is conveyed into the atmosphere. Evaporation from bare soil combined with transpiration is in fact the most important element entering into computations relating to ground water for this region.

Owens Valley is an ideal location for carrying on such experiments. In the first place, the source of water available for evaporation may be kept under the complete control of the observer as regards amount and rate of supply. Storms are rare and the total precipitation small, so that little uncertainty exists from this cause regarding the amount of percolation from precipitation upon the surface of a body of isolated soil. Second, the method by which the surface soils of the valley floor are kept moist can be artificially reproduced on a small scale with only a slight departure from natural conditions. The source of supply for soil moisture is a permanent ground-water surface from which water is drawn by capillary forces. This ground water is replenished by percolation from the precipitation and surface water of the intermediate mountain and outwash slopes, which seeps laterally toward the valley floor and lies beneath it under hydrostatic pressure sufficient to maintain a permanent ground-water surface. Similar pressure can be reproduced in the bottom layer of an isolated body of soil, and capillary forces can be depended upon to raise moisture to the surface. Finally, the large annual depth of evaporation makes possible a more accurate determination of its amount

[1] First Ann. Rept. Los Angeles Aqueduct, appendix D.

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than in a less arid region. Experiments carried on unde ditions have been very satisfactory.

The rate of evaporation from soil depends on the ten the air and soil, the quantity of moisture already in the i surrounding atmosphere, the amount of moisture in the su of the soil, and the character of the vegetation and othe ing. The first two of these factors have the same ef evaporation as on that from free water surface—higher temperatures result in increased evaporation, as does atmosphere or increased movement of wind. The thir directly proportional to the rate of evaporation, because moisture occurs from soil grains at or very near the su amount of moisture in the soil available for evaporation th upon the character of the soil as regards capillarity an ground-water surface.[1] For example, in a coarse sandy soil "gravity water" will be drawn to the surface through lary spaces from depths not exceeding 4 feet, while in a fin clayey soil water will be drawn from depths as great as 8 last factor, the extent and character of vegetation, affects ration rate both through the activity of transpiration and upon capillarity. Plant roots are continually absorbing w the soil; this water passes off into the atmosphere through and the evaporation losses from soil are greatly increase The roots of native salt grass will penetrate to a depth o search of water. A further effect of the growth of veget increase the vertical capillary flow of moisture through so of the many tubes filled with the rotted fiber of dead roo tubes are the result of years of growth and penetrate the directions above the ground-water surface.

The purpose of the experiments was to obtain data s complete to compute the total volume of water annuall evaporation and transpiration from the valley floor. This making observations under the various local conditions wh soil evaporation. The plan was to reproduce natural con isolated bodies of typical soil and determine the evaporat from for varying climatic conditions, depths to ground wa and vegetation.

The experimental equipment consists of two galvanized 6½ feet in depth connected at the bottom by an 18-foot leng vanized pipe. (See Pls. XII, *B;* XIII.) The smaller tan 4$\frac{3}{16}$ inches in diameter and is furnished with a tight-fitti The larger tank is 7 feet 5¼ inches in diameter and has a branching perforated pipes at the bottom connected with

[1] Buckingham, Edgar, Studies in the movement of soil moisture: Bull. Bur. Soils No. 2 Agr., 1907.

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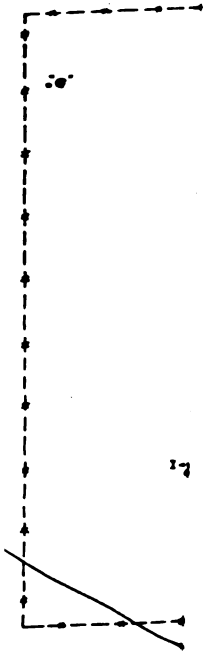

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from the smaller tank. The two tanks and all connections are water-tight, and water poured into the smaller or reservoir tank passes into the larger or soil tank and escapes through the perforations. These two tanks were placed in excavations of proper size to receive them, the soil tank was filled with the excavated soil, and the reservoir tank was filled with water. A 6-inch layer of screened gravel too coarse to enter the $\frac{1}{16}$-inch perforations was laid in the bottom of the soil tank to insure an uninterrupted and well-distributed feeding of water from the reservoir tank into the superimposed soil. As soon as the material became saturated and capillary action established to the surface, the water level in the soil was brought to the desired depth and kept there by supplying water to the reservoir tank in measured quantities. Volumetric measurements of water poured into or withdrawn from the reservoir tanks were made with an ordinary gallon measure. Accumulation or depletion of the supply in the reservoir tank was determined volumetrically by measuring the depth of water with a steel tape. The volume passing out of the reservoir tank during a given period represents the total evaporation from the soil tank during that period.

The position of the ground-water surface in the soil tank was determined by measuring its depth below the ground surface in augur holes of 2-inch diameter bored in the soil to a proper depth. Measurements were made from a fixed point with a steel tape weighted at the end and chalked before each observation. Three holes were placed in each tank halfway between the center and rim on radii 120° apart. For reasons noted below some of the tanks were provided with six holes placed on radii 60° apart. The holes were not bored deep enough to reach the bottom layer of coarse gravel, and the water level in them represented the ground-water surface in the surrounding soil. An average of the observations made at a given time was assumed to represent the general depth to ground water for the tank at that time. The tendency for the sides of the holes to cave in and the bottom to fill with sand was controlled by casing them with 2-inch galvanized sheet-iron pipe generously perforated with $\frac{1}{16}$-inch holes. These pipes were so driven that the top was just flush with the ground surface, and they were closed at the top with wooden plugs. In some of the tanks it was found impossible to bring the ground-water surface to the desired level with the available hydrostatic pressure from the reservoir tanks, and 2-inch holes were bored between the observation holes to the saturated gravel layer. Water usually rose in these holes to the same height as in the reservoir tank and by seeping laterally into the soil built up the ground-water surface. It was found difficult to keep these holes open to the gravel, however, and the water level in most of them eventually represented the ground-water surface.

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Three tank sets were installed in the open valley floor east of Independence in February, 1909. (See Pl. XIII.) The surface of soil tank No. 1 (Pl. XIV, *A*) was bare sand; Nos. 2 and 3 (Pl. XIV, *B*) were laid with salt-grass sod. The initial plan formulated for tank sets Nos. 1 and 3 was to hold the ground-water level at various depths below the ground surface for periods of a few weeks during the summer while the climatic conditions were constant, in order to obtain, in a short time and with few tanks, trustworthy results of a general nature. The movement of the water surface from one level to another consumed so much time, however, that winter approached before the experiments on the lower levels were reached, and furthermore, there was no accurate method of determining the volume of evaporated water represented by the differences in depth. The experience of the first year's work with these tanks showed the necessity of maintaining a fixed ground-water level during a complete cycle of climatic changes. In soil tank No. 2 it was at first proposed to hold the ground-water level at or near the ground surface, but so great was the rate of summer evaporation that this plan was found to be impracticable with the equipment available. To remedy the defect the hydrostatic pressure from the reservoir tank was increased by soldering to it a 3-foot extension, but this extension could not be used until late in the season. This experience suggested the desirability of placing the reservoir tanks above the soil tanks and of increasing the size of the feed pipe from three-quarters to 1 inch.

In order to test this plan four additional tank sets were installed in January, 1910. The reservoir-tank outlets were placed about 1.7 feet above the soil-tank inlets, and 1-inch pipe was used throughout. The new soil tanks were laid with salt-grass sod, which grew fairly well. In tank set No. 1 the depth of water in the reservoir tank was held at 6 feet to maintain a uniform hydrostatic pressure in the soil tank, and thus reproduced natural conditions. No attempt was made in this set to control ground-water fluctuations artificially. In tank sets Nos. 2 to 7 water was supplied to reservoir tanks in quantities such that the depths to ground water were respectively 5 feet, 4.5 feet, 4 feet, 3 feet, 2 feet, and 1 foot. Observations were carried on continuously in the seven tanks for one year in order to study the effect of the ordinary range of climatic conditions. In this plan sufficiently complete data were obtained to make computations of evaporation loss from the valley floor.

The details of the observations on soil evaporation for each tank set are shown graphically in Plates XV to XXI. The supply of water available to the soil from the reservoir tank is the element under complete control of the observer, and at the top of each diagram are statements of the purpose governing additions to or withdrawals from this supply during various periods of time. Below

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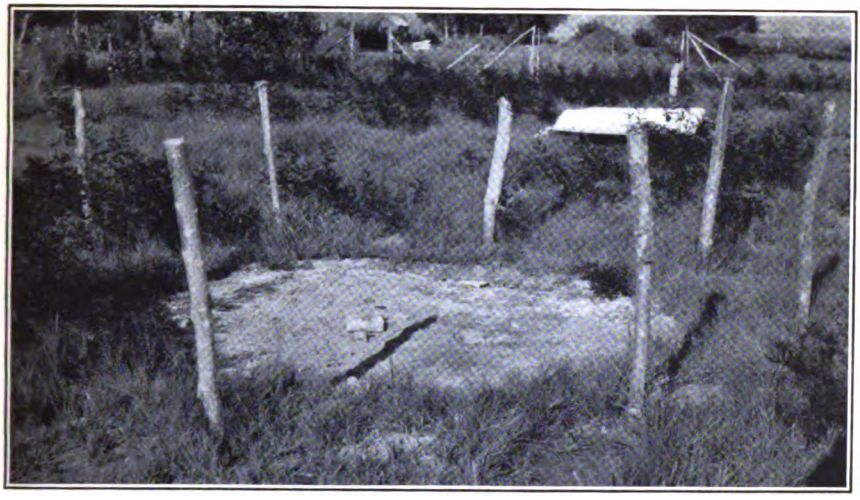

A. SOIL TANK No. 1 IN OPERATION.

B. SOIL TANK No. 3 IN OPERATION.

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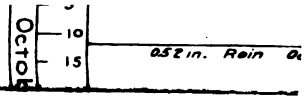

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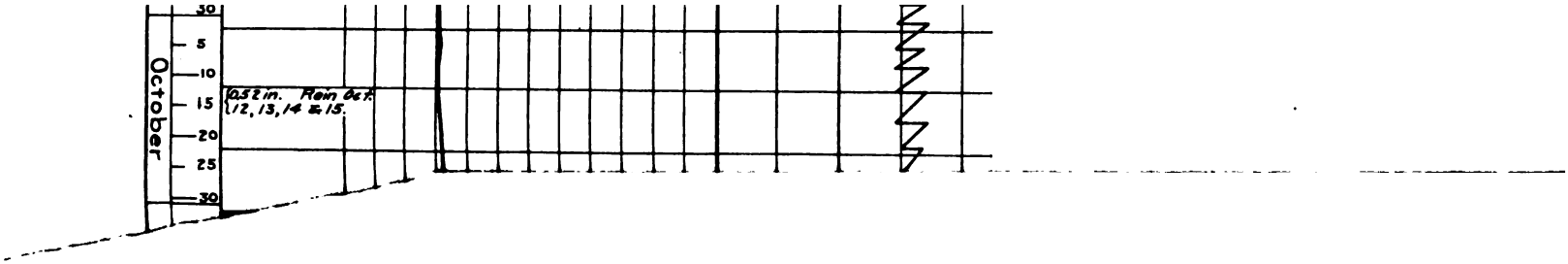

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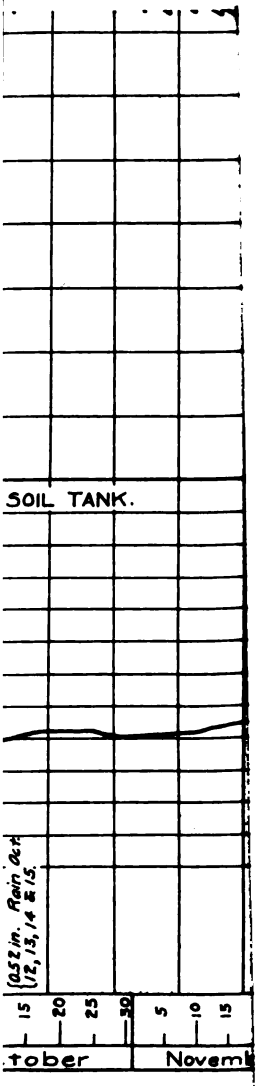

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October	15	0.82 in. Rain Oct. 12, 13, 14 & 15.
	20	
	25	
	30	
November	5	
	10	
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is platted a broken line representing the fluctuation of water surface in the reservoir tank, the vertical portions indicating additions to or withdrawals from the reservoir supply made by the observer and the inclined portions indicating the soil-tank draft. There is also platted a mass curve showing the aggregate volume of water supplied to the reservoir tank, which appears as a series of vertical and horizontal lines. At the bottom of each diagram is platted an undulating line representing the fluctuation of ground-water surface in the soil tank, each depth being obtained by averaging the depths recorded in the observation holes.

The small part that precipitation plays in ground-water fluctuations in Owens Valley is well shown by these diagrams. The average annual precipitation at the experiment station is about 4.38 inches the season 1909–10 being normal and 1910–11 well above normal. At the bottom of the diagrams are noted the date and amount of precipitation for each storm. It is seen that even in a wet season percolating water does not penetrate to depths exceeding 2.5 feet, unless more than 1 inch falls within a short period on moist soil. Even then it does not appear to reach depths greater than 4 feet. The problem of percolation from rainfall is therefore practically eliminated from the experiments. When rising ground water was noted in a soil tank after precipitation, the volume of percolating water was estimated from the observed rise and included in the mass curve as noted on the diagrams.

The amount of water evaporated from the soil surface of any tank during a given period can be computed accurately from the diagrams, when the depth to ground water at the beginning and end of the period is the same, by noting from the mass curve the amount of water supplied to the reservoir tank during the period and the accumulation or depletion in the reservoir tank. The sum of these quantities with their proper algebraic sign gives the loss by evaporation. For differing depths to ground water, however, the computations are only approximate, because the proportion of empty space in the soil layer and the amount of moisture it contained initially are both unknown.

A summary of the results for each tank set by months for the year June 1, 1910, to May 31, 1911, is presented in Tables 52 to 58. It will be seen that in tank set No. 1 the draft on the reservoir tank varied as well as the ground-water surface in the soil tank, and that the fluctuations of the latter only partly represent the variation in evaporation rate. The average difference of water level in the two tanks was only 1.2 feet, however, so that the pressure was probably not as great as under natural conditions. The results for this tank are thus not as conclusive as desired. In tank sets Nos. 2 to 6 ground-water level was maintained at the desired depths, but in

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tank set No. 7 the pressure from the reservoir tank was not sufficient between April and September to hold the water level at the 1 foot depth. The average head of water in the reservoir tanks during the six months from April to September, inclusive, for sets 2 to 7, was 0.22, 0.59, 1.68, 2.02, 2.20, and 2.61 feet, respectively, indicating that a progressively greater pressure is required to maintain the ground-water level at shallower depths. As the average summer depth to ground water in soil tank No. 7 was 1.67 feet, it would require a maximum head of possibly 3.5 feet to supply water in sufficient quantities to meet the evaporation demand from ground-water surface at a depth of 1 foot.

The annual depth of evaporation from the several soil tanks exhibited a consistent decrease with increase of depth to ground water and varied from 43.1 inches for No. 7 to 7.9 inches for No. 2. The depth of summer evaporation varied from 77 to 83 per cent of the annual in the several tanks and averaged 79 per cent. The month of maximum evaporation is August, and minimum evaporation occurs most commonly in February. Examination of Plates XV to XXI, however, shows that the exact dates of maximum and minimum evaporation rates for the several soil tanks occur early in September and late in March, respectively, and follow each other consecutively with greater depth to ground water. The approximate dates of maximum and minimum air temperatures at Independence are July 10 and January 10, respectively, but no measurements were made to determine the lag of corresponding soil temperatures at various depths. The extremes of evaporation from water surface agree in time of occurrence with maximum and minimum air temperatures, however, and the observed lag in soil evaporation is in general consistent with observed lag in soil temperatures in other localities. Hence it is reasonable to conclude that extremes in rate of soil evaporation and soil temperature are concurrent at a given depth.

A graphic study of the data in Tables 52 and 58 for the periods April 1 to September 30 and October 1 to March 31, which are, respectively, periods of increasing and decreasing evaporation rate, is presented in figure 5. There appears to be during each period a straight-line relation between total evaporation and depth to ground water. The limiting depth is apparently 7.5 feet, and the total evaporation when water and ground surface coincide 42.3 inches and 10.2 inches, respectively. The total depth of evaporation in inches being represented by E and the depth to ground water in feet by D, the equations representing variation in evaporation with depth to ground water are $E = 42.3 - 5.64\ D$ and $E = 10.2 - 1.36\ D$. Capillary conditions and plant-root systems have not reached their natural state in most of the tanks, although each year of maintenance brings the equipment nearer perfection, as can be seen by noting that the

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total evaporation in May, 1911, exceeds that of June, 1910, even though temperatures during early 1910 were above normal and during early 1911 below normal. Tank No. 6 probably represents conditions most nearly normal, because capillary action is strong at that depth, and plant roots have not far to go to reach water. Observations of depth to water in transition zones between meadow and desert land indicate that soil evaporation ceases at a depth of 8 feet instead of

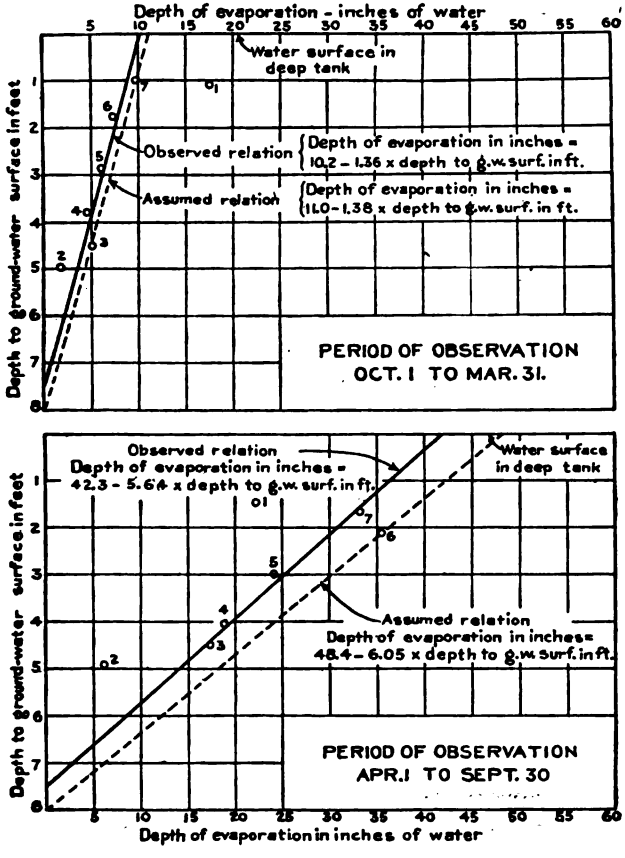

FIGURE 5.—Relations between evaporation, soil, and depth to ground water.

7.5 feet. From these considerations, lines are assumed which it is thought more nearly represent natural conditions, their equations being $E = 48.4 - 6.05\ D$ and $E = 11.0 - 1.38\ D$. It will be noted that the depth of evaporation from the water surface in the deep tank from April 1 to September 30 is practically equal to that obtained by substituting $D = 0$ in the first of these equations. Hence, during the summer period evaporation from the deep water tank represents the maximum soil evaporation from meadow land of this type. During

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the winter, however, the water evaporation is almost twice the maximum soil evaporation.

The great difficulty in carrying on experiments relating to evaporation from soil is in reproducing natural conditions as regards atmospheric exposure of the isolated body of soil, its temperature, means of acquiring moisture, plant growth, and capillary state. It is believed that the experimental equipment employed in these investigations when operated with fixed ground-water level will, for all practical purposes, duplicate natural conditions by the end of two seasons' observations. The first year's results are regarded as being too small, because of insufficient development of plant-root systems and incomplete establishment of channels for the rise of water by capillarity. The cost of the tank equipment and installation is greater than that of the kind used by the Department of Agriculture,[1] but the operation is much simpler and less expensive and the results are fully as reliable.

TRANSPIRATION.

A considerable portion of the water evaporating from soil is absorbed by plant roots and carried upward through the stem and into the foliage, whence it escapes in the process of transpiration. This process continues as long as the plant has life, but is most active during the growing period. Transpiration differs in different species of plants and even in the same species when existing under different conditions of light, atmospheric pressure, soil texture, and available moisture in the soil. King's experiments indicate that humidity does not affect transpiration.[2] For a species growing in a definite locality, light and available soil moisture are the controlling factors.

The process of transpiration and respiration in plants is similar to the breathing of animals. Both plants and animals inhale air and exhale from the respiratory organs large quantities of water. The lungs of animals are intended primarily to provide a means for the entrance of oxygen into the body and for the escape of carbon dioxide, but they can not perform their functions unless the interior lining of the air cells is kept moist. Similarly the breathing surface of a plant must be kept moist, and, as a protection from too rapid evaporation, this surface is within the plant structure, principally in the foliage. Plant leaves are inclosed in a relatively impervious skin or epidermis in which are small breathing pores or stomata which automatically open or close, depending on the needs of the plant for a greater or less amount of air. When exposed to light the food-manufacturing processes of a green plant are stimulated and require a continually changing volume of air in contact with the breathing surface. The

[1] Fortier, Samuel, Evaporation losses in irrigation and water requirements of crops: Bull. Office Exper. Sta. No. 177, U. S. Dept. Agr., 1907.

[2] King, F. H., Irrigation and drainage, New York, 1899.

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stomata open proportionally to the light intensity. Should the water supply in contact with the roots be insufficient, the breathing surface may become dry, and when that happens the stomata automatically close until the proper amount of air is admitted for the plant to do its work under the new conditions. The stomata therefore control the amount and rate of loss of water from plants by transpiration.

There is a marked diurnal periodicity in the rate of transpiration which investigators are led to believe is largely the result of varying

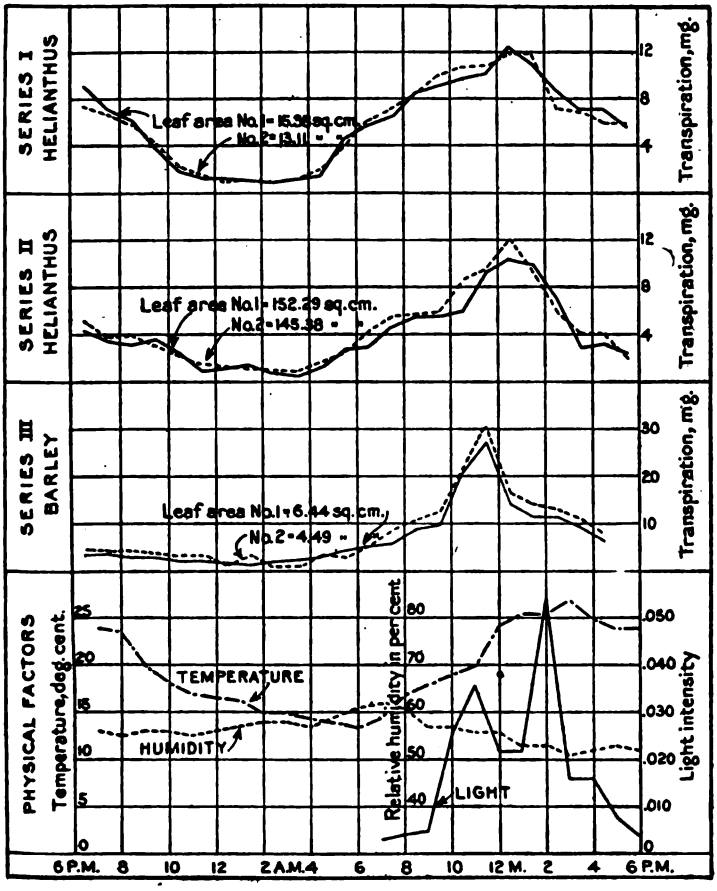

FIGURE 6.—Relation of transpiration to intensity of light.

intensity of light. This periodicity is well illustrated by observations made under the direction of Frederick E. Clements, State botanist of Minnesota, and reproduced in figure 6.[1] Measurements of transpiration were made hourly from 6 p. m. February 16 to 6 p. m. February 17, and the physical factors were observed between the hours. The day was cloudy throughout, so that variation in temperature and

[1] Sampson, A. W., and Allen, L. M., Influence of physical factors on transpiration: Minnesota Bot. Studies, pt. 1, vol. 4, 1909, p. 42.

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humidity was slight. The diagrams show very strikingly the response of transpiration to changes in intensity of light.

The amount of water required by the common types of vegetation has been variously estimated by investigators working under differing climatic conditions and by differing methods. The German experiments especially are well known, and King, at Madison, Wis., has obtained valuable data. Table 59, summarizing a portion of the results of his experiments, is reproduced from King's book "Irrigation and drainage." The experiments were carried on in the field, where natural conditions could be reproduced.

No measurements of transpiration that have been made under conditions similar as regards altitude and aridity to those in Owens Valley are available. It is unnecessary in the present study to know separately the transpiration from wild grasses and evaporation from bare soil, because the area of the latter is relatively small. The experiments on soil evaporation were therefore planned to give the combined loss from these two causes. It is desirable, however, to know the amount of transpiration from field crops, to aid in computing the amount of percolation from irrigation. Observations for such crops were confined to alfalfa.

The method of measurement was based on the assumption that the rate of loss of water from freshly cut plants would correspond closely with that before cutting. The plants were rapidly cut from a measured area, weighed, and spread out on paper to cover the same area as before cutting. At short intervals they were reweighed until there was no further appreciable loss. No noticeable wilting occurred during the first 15 minutes, and the rate of loss during this period was used as a basis for calculations.

The results of the measurements are shown graphically in figure 7. Four average samples were cut, at 8.45, 9.15, and 10.30 a. m., and 2.02 p. m. The initial weights of the samples were 3 pounds 15½ ounces, 4 pounds 7 ounces, 5 pounds 5 ounces, and 4 pounds 7 ounces. In Table 60 are given the losses from each sample in ounces to the square yard for various periods during the first two hours.

The rapid decrease in the rate of loss is very noticeable. Inspection of figure 6 will show that the rates of transpiration at 8.45, 9.15, and 10.30 a. m., and 2.02 p. m., expressed as percentages of the average rate for 24 hours, are respectively 128, 141, 177, and 197, an average of 161 per cent. If a similar relation is assumed the average loss in a 24-hour day from the four alfalfa samples would be 366 ounces to the square yard of field area, or 0.49 inch in depth. This figure appears rather large at first glance, for the rate of evaporation for that day from the pan in Owens River was 0.30 inch, and that from the shallow pan in the soil was 0.38 inch. The results obtained by German investigators [1] indicate the loss from sod during

[1] Bull. Forest Service No. 7, U. S. Dept. Agr.

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the growing season to be 92 per cent greater than from water surface, and that from cereals to be 73 per cent greater. Furthermore, the humidity of the air after passing over an alfalfa field is very noticeably greater than after crossing a body of water. The result obtained in the experiment here described is therefore within reason.

The growing season for alfalfa in the vicinity of Independence is marked by an entire absence of cloudiness. It extends from about April 15 to September 30, during which time three crops mature, the yield being about 5 tons of dry matter to the acre. The samples used for the experiments were almost ready for the second cutting.

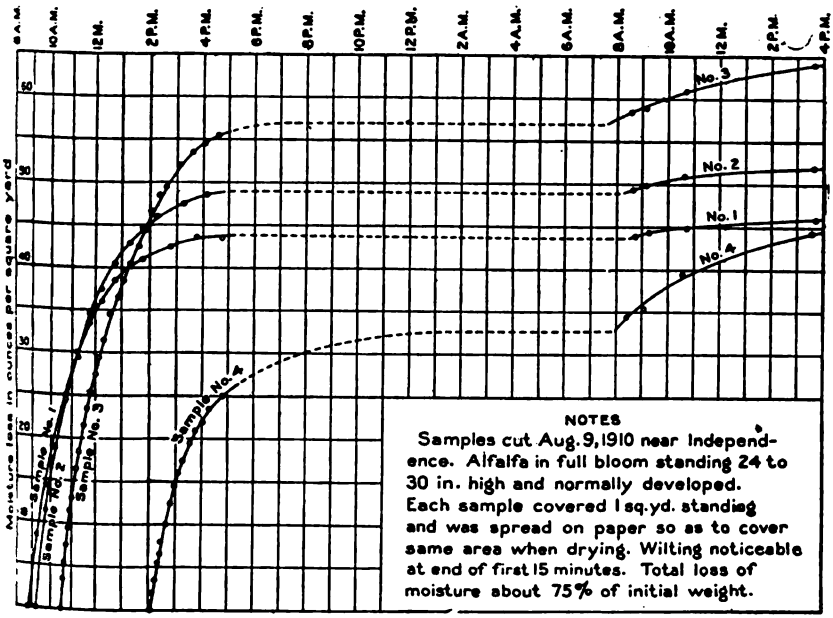

FIGURE 7.—Rate of loss of water by transpiration from freshly cut alfalfa.

On the assumption that the average area of transpiring surface during the entire growing season was 50 per cent of that on the day of the experiment, the total loss of water during the season would amount to 41 inches, or 3.43 feet in depth. With a production of dry hay amounting to 5 tons to the acre there would therefore be 1 pound of dry matter for every 93.5 pounds of water lost by transpiration. These results, though apparently large, are regarded as approximately correct and are used as a basis for further computation.

SUMMARY.

The depth of evaporation from snow which falls upon the high mountain areas is approximately 7.7 inches annually.

The depth of annual evaporation from the surface of water near Independence in a pan floating in Owens River is 67 inches, in a pan

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set in soil approximately 85 inches, and in a deep tank set in soil 69 inches. The percentages of these totals occurring between April 1 and September 30 are 75, 77, and 70, respectively.

The depth of combined soil evaporation and transpiration from the grass lands of the valley floor, as experimentally observed, is expressed by the equations $E=42.3-5.64D$ and $E=10.2-1.36D$, the first applying to the period April 1 to September 30 and the second to the period October 1 to March 31. These equations are believed to give results too small. The depth of summer evaporation averages 79 per cent of the annual for the various depths.

The depth of combined soil evaporation and transpiration in irrigation near Independence is about half the depth of water applied.

PERCOLATION.

CONDITION AND MOVEMENT OF WATER IN SOIL.

Water reaching the surface of porous unsaturated ground has a tendency to pass downward to the surface of saturation. This process, known as percolation, is very important in connection with the occurrence of underground water. A short summary of the principles governing the condition and movement of water in the soil is therefore not out of place in this report.

Most of the water contained in a soil exists in either a capillary or a gravitational state. "Capillary water" occupies a thin film surrounding each soil grain and also the space adjacent to points of contact with other soil grains. It is capable of movement in any direction through the soil in response to the force known as surface tension, but it will not leave the soil except by evaporation. When equilibrium has been established in soil containing water, capillary movement can occur only as a result of evaporation or a change in surface tension. When evaporation occurs the movement is toward the region of depletion. A change in surface tension may be brought about by the introduction of soluble salts or foreign liquids, such as oil, and it results in either an increase or decrease of the proportion of void space occupied by capillary water. If an increase, more water will be drawn upward from the surface of saturation, or, if there is no capillary connection with a body of saturated soil, there will be a contraction of the region containing capillary water; if a decrease, water will drain downward to the surface of saturation, or there will be an expansion of the capillary region. The extent of capillary action is greater in moist than in dry soils, as is also the rate of advance of water.

"Gravity water" occupies the void spaces in soil which are not capillary in nature, and it is free to drain away under the pull of gravity. The relative amount of capillary and gravity water in a

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saturated soil depends on the texture and structure of the soil, the surface tension of the soil water, and the length of soil column considered. For example, in very fine clays the interstitial space is entirely capillary, and even when saturated water will not drain from it. In coarse-grained soils, however, the capillary space is relatively small and a portion of the contained water will drain off readily. With a given sample of soil, changes in surface tension or the position of the surface of saturation will cause variation in the relative amounts of capillary and gravity water.[1]

The amount of water which reaches the surface of saturation and becomes a permanent addition to the ground-water supply of a region depends on the amount of water entering the soil and the rapidity with which it passes beyond the reach of capillary forces tending to bring it back to the surface. The amount entering the soil depends on the total volume of water at the surface, the texture and structure of the surface soil and subsoil, the rate of evaporation, and the slope and smoothness of the surface. The rapidity of its descent depends on the amount of moisture already in the soil, the texture and structure of the soil, and the depth to the surface of saturation. Percolation is favored by coarse and loosely arranged soil grains, a moist soil, large precipitation or surface flooding, low rate of evaporation, a gently sloping and uneven surface, and a depth to the surface of saturation greater than the limit of capillarity.

A permanent body of ground water exists in the void spaces of the porous material filling the closed rock basin of the Independence region. The source of this ground water is percolation from precipitation and from other water which occurs upon the surface of the valley fill, the latter being derived from surface streams, irrigation water, and surplus water from mountain streams which occasionally flood portions of the valley floor. The total amount of this percolation may be estimated from data already presented.

PERCOLATION FROM PRECIPITATION.

All portions of the region receive precipitation, but there is wide local variation in the amounts that enter the ground and percolate downward to the surface of saturation. The impervious rock surfaces of the high mountain drainage areas shed all precipitation which they receive except that lost by evaporation, but accretions to the ground water from precipitation on the remaining areas of the region are of considerable importance.

Conditions are exceptionally favorable for percolation on the intermediate mountain slopes. As has been stated, the formation is very

[1] Briggs, L. J., Mechanics of soil moisture: Bull. Bur. Soils No. 10, U. S. Dept. Agr., 1897, p. 5.

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porous (Pl. III, p. 13) and practically none of the run-off reaches living streams. All precipitation but that lost by evaporation can therefore be considered as percolating downward to the surface of saturation and becoming a permanent addition to the ground-water supply. Snow is practically all melted before May 15, so that the period of direct exposure to evaporation is not as long as at higher levels, although the rate is greater. Evaporation losses from the moist soil are very small. Before it is melted the snow blanket protects the soil surface, and by its gradual and uninterrupted melting it fills the capillary spaces to considerable depth, so that gravity water passes downward rapidly. When the snow disappears the rapid drying of the soil surface soon interrupts upward capillary movement, thus preventing further evaporation loss and allowing the percolating water to reach the surface of saturation. In view of these facts, the percolation factor is regarded as being about 0.75 for the more elevated areas receiving approximately 20 inches of precipitation. Less-favored areas were assigned smaller factors after a study of their individual characteristics.

The results of computations of the total amount of percolating water yielded by the intermediate mountain slopes are shown in Table 61. The method was to determine the mean seasonal precipitation at the center of area of each triangular subdivision, multiply this by the area in square miles, and apply a percolation factor. The area of each subdivision and the horizontal and vertical position of its center were obtained from Table 3. Diagrams Nos. 7, 8, 10, 11, 13, and 14 on Plate VIII were used in determining the depth of precipitation. The values differed slightly as read from the altitude and distance diagrams and the average was adopted as the most reliable. The total volume of precipitation upon the 29.4 square miles of intermediate mountain slope is 27,580 acre-feet, of which 19,700 acre-feet is a permanent addition to the underground water supply of the region. Expressed as a continuous flow, the total percolation from this area is 27 second-feet, and the yield per square mile ranges from 1.07 second-feet in the vicinity of Taboose Creek to 0.72 second-foot near Bairs Creek, with an average of 0.92 second-feet.

The outwash slopes yield to the underground supply a much smaller volume of water, which is derived principally from slopes above the 5,500-foot contour. Precipitation occurs as snow less often here than on the higher slopes and usually melts within a few days after falling. The capillary water in the upper layers of the soil thus has opportunity to evaporate after each storm and it is only when several storms occur in succession that there is enough percolating water to penetrate the ground beyond possibility of return. The long dry summer and the desert conditions draw all moisture from the ground to considerable depths, however, and the progress of

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percolating waters is slow because the capillary spaces must be refilled. Test pits dug in the region of the 4,500-foot contour 10 days after a series of storms showed a penetration of capillary water to a depth of 4 feet and the entire absence of gravity water. The total precipitation from these storms at this point was about 3.5 inches, which, with a 28 per cent available pore space, would represent 1 foot of completely saturated soil. (See Pl. XXVIII, p. 82, test pit No. 11.) Considering the evaporation losses it is not surprising that there was no gravity water within the depth of penetration observed. Observations made at higher elevations showed gravity water in considerable quantity at a depth of 12 feet. Percolation factors varying from zero to 0.60 were assigned to the several zones of the outwash slope as a result of these field observations.

The results of computations for the total amount of percolating water yielded by the outwash slopes are shown in Table 62. The whole area of 165 square miles was divided into zones lying between contours at 500-foot intervals from about 4,000 to 6,500 feet and the zones in turn were divided into groups corresponding with the precipitation gages. The method of computation was to average the precipitations for adjacent contours obtained from diagrams Nos. 7, 8, 10, 11, 13, and 14 of Plate VIII. These averages represented the average precipitation for each zone in each group and, when multiplied by the area and the percolation factor, gave the amount of percolating water which reached the permanent ground-water level. The total annual precipitation on the outwash slopes is 62,000 acre-feet, of which 16 per cent, or 9,800 acre-feet, is effective percolating water. Expressed as a continuous flow the volume of percolating water amounts to 13.4 second-feet.

Throughout the valley floor the surface of saturation is so close to the ground surface that capillary connection is maintained during most of the year and percolation from precipitation is rapid. The depth of penetration is usually slight, however, because precipitation in single storms is small. Several storms in succession or a warm rain on snow will result in a rise of ground water, but the total average ground-water supply from this source does not exceed 4 second-feet.

Direct percolation from precipitation therefore furnishes a continuous flow of 44 second-feet to the underground supply of the region.

PERCOLATION FROM STREAM CHANNELS.

The most important source of underground water in a desert region is percolation from stream channels. This process is continuous from perennial streams, although it varies with the discharge of the stream and the temperature, as previously indicated. Beneath each stream channel as it crosses the outwash slope is a "ridge" of ground

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water rising from the general plane of saturation. The inclination of the slopes of this ridge and the breadth of its base vary periodically with the stage of the creek and the time of year. There is complete saturation within its slopes and a movement of gravity water toward the general ground-water surface. A considerable amount of water also percolates from intermittent streams.

Percolation from stream channels in the Independence region is confined to the creeks draining mountain canyons. It begins where the stream leaves its canyon to cross the outwash slope and continues to and in some streams beyond the edge of the valley floor. There are 17 of these streams, 11 of which are perennial throughout their channels, 5 perennial over the upper portion of their channels only, and 1 (Dry Canyon) entirely an underground stream. The surface flow of the two most northerly of these streams, Tinemaha and Red Mountain creeks, discharges northward across the Poverty Hills into the Bishop-Big Pine region, but the percolation from their channels is tributary to the Independence region. This region receives both the surface and the underground flow of the creeks from Taboose to Hogback, inclusive. The channels of these streams are continuous from their canyons to the United States Geological Survey gaging stations, below which they divide, irrigation ditches carrying all the flow except during the high-water period of wet years, when the excess passes down the natural channels. The problem is thus divided into the determination of percolation above and below the Government gaging stations. The first subject has already been discussed at length and need not be considered here in detail. An inspection of Tables 43 and 44 shows that for the creeks from Taboose to Hogback, inclusive, the total 21-year average discharge at the mouths of the canyons is 130 second-feet and at Government gaging stations 84 second-feet. If the flow of 2 second-feet from spring No. 2 on Division Creek is included with the canyon discharge, the percolation loss above the Government gaging stations is 48 second-feet. To this should be added 6 second-feet, as indicated by the diagrams, for Tinemaha and Red Mountain creeks, making a total of 54 second-feet.

The amount lost below these stations is not so easily determined on account of the numerous channels and irregular flow. For example, the water diverted from Oak Creek is distributed by seven main ditches whose aggregate length, not including field laterals, is approximately 4 miles. The flow in these ditches varies with the stage of the creek and with the needs of the irrigators. The field work necessary to determine channel losses below the Government stations accurately was so great that it was not attempted. Estimates were made on each creek, however, based on the length of main channel and distributing ditches outside of irrigated areas. The loss per mile was

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assumed to be the average annual loss per mile for the upper channel of the creek, and the total percolation loss from stream channels below the Government stations was estimated at 25 second-feet continuous flow. This estimate does not include percolation from waste irrigation water or surplus creek water which has passed east of the ranches.

The total addition to the underground supply derived by percolation from stream channels is therefore 79 second-feet continuous flow.

PERCOLATION FROM IRRIGATION.

Irrigation has been practiced throughout this region in connection with farming for at least 30 years and is a permanent factor in the underground water problem. The total area under systematic irrigation is approximately 3,000 acres, divided into a number of isolated ranch groups which depend on the mountain creeks for their supply. Oak Creek, the largest of these streams, supplies about 45 per cent of the whole area. The remaining area is divided among eight creeks and the Stevens ditch, which during the period of observation has been largely supplied by the surplus flow of the creeks. The acreage irrigated from each source is given in Table 63. About 50 per cent of this land was originally desert lying along the lower margin of the outwash slope and is very porous. The remainder lies in the valley floor, where permanent ground water is within reach of plant roots and where clay soils predominate. The location of the several areas is shown on Plate I. Alfalfa and grain are irrigated by flooding and corn by the furrow method. Three crops of alfalfa are raised each year, and the irrigating season extends from about April 15 to October 15, although some farmers irrigate 9 months in the year. Grain is irrigated early in the season and corn late, so that the water is continually employed. In most places the use of water is lavish, and no attempt is made to economize it or even to apply the amount best suited to the crop and soil conditions.

A basis for determining the percolation from irrigation is a knowledge of the duty of water, or the quantity of water used in maturing a given area of crop. This was obtained in 1909 by carefully measuring the amount of water used during the irrigating season on five typical ranches which derived their supply from Oak Creek. Gages were established at permanent sections in the supply ditches near the points of entrance to the ranches, and the amount of water delivered was computed from daily gage readings and weekly current-meter measurements. On ranches where there was a continual waste from irrigation the surplus water was also measured. Areas in crop were obtained from a careful stadia survey of each ranch.

Ranch No. 1 is situated on rather high, well-drained land of a sandy and porous texture. The permanent ground-water level is 10 to 15

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feet below ground surface. The irrigators are economical in their use of water. The total area in crop during 1909 was 109 acres, 33 per cent being alfalfa, 30 per cent corn, 28 per cent barley, 4 per cent potatoes, and 5 per cent orchard and vineyard. The observed duty of water was 7.22 acre-feet an acre, which for this type of soil and location represents about the least amount of water which will mature these crops.

Ranch No. 2 is situated east of No. 1, on soil which varies from light sandy to black clayey, the latter predominating. The ground-water level ranges from 10 feet below the surface along the west boundary to about 4 feet in the bottom land. The total area in crop in 1909 was 154 acres, the percentages being as follows: Barley 43; alfalfa, 31; corn, 15; and miscellaneous, 8. The observed duty of water was 2.80 acre-feet an acre, an amount greater than that ordinarily used on the damp bottom land because of the area of sandy land included.

Ranch No. 3 has black clay soil throughout, and the ground-water level averages about 4 feet below the surface. The total area in crop in 1909 was 260 acres, of which 33 per cent was barley, 31 per cent corn, 25 per cent pasture, 4 per cent alfalfa, and 7 per cent miscellaneous. The observed duty of water was 2.34 acre-feet an acre, which represents the average amount used for this type of soil in this locality.

Ranch No. 4 has the well-drained sandy soil of porous texture which characterizes No. 1. Permanent ground-water level is 10 to 15 feet below the surface. Irrigation is carried on in a very lavish and wasteful manner. The total area in crop during 1909 was 49 acres, of which 46 per cent was alfalfa, 40 per cent corn, and 13 per cent barley. The observed duty of water was 15.40 acre-feet an acre, which is about the amount of water ordinarily used on this type of soil throughout the region.

Ranch No. 5 is situated similarly to No. 4 and has experienced a similar lavish use of water. The area in crop in 1909 was 38 acres, of which 87 per cent was alfalfa, 8 per cent potatoes, and 5 per cent miscellaneous. The observed duty of water was 16.40 acre-feet an acre. The methods of irrigation were similar to those practiced on Ranch No. 4, and the results indicate the large demands of alfalfa for water.

With conditions on these typical ranches in mind, an examination was made of all other ranches in the region and values estimated for the duty of water on each. The number of acres irrigated and in crop was also determined approximately by reference to subdivisions of the public survey. From these data the volume of water used for irrigation was computed as shown in Table 63. The total volume used during the six months, April 15 to October 15, is

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about 26,000 acre-feet, equivalent to a continuous flow during the period of 72 second-feet. When spread out over 3,010 acres this represents an average depth of 8.6 feet. This result probably represents average practice throughout the Owens Valley, for the duty of water measured by the Reclamation Service during the season of 1904 on two typical ranches near Bishop was 7.11 and 9.17 acre-feet an acre.

The distribution of this water as regards evaporation, transpiration, and percolation beyond the reach of plant roots is the next step in computing the ground-water supply from this source. Direct evaporation is relatively small, for the water when spread out over the fields is shaded by the crop and sinks rapidly into the ground. Probably 10 per cent would cover this loss. The transpiration loss from alfalfa during the irrigating season has already been computed as 3.43 feet depth of equivalent water, or 40 per cent of the average volume of water applied to crops. The transpiration loss from corn and small grains is probably less in this locality, but the direct evaporation loss is greater. Therefore 50 per cent, or 4.3 feet depth, represents the amount of water applied in irrigation in this region which is absorbed by the atmosphere. The other 50 per cent is a permanent addition to the ground-water supply and is equivalent to a continuous flow throughout the year of 18 second-feet.

PERCOLATION FROM FLOOD WATER.

The amount of percolation from surplus creek water which spreads out over the valley floor to a greater or less extent is difficult to determine. Of the 84 second-feet average flow at Government gaging stations, 61 second-feet is disposed of in channel percolation and irrigation. Possibly 5 second-feet of the remainder reaches Owens River. This leaves 18 second-feet to be divided between evaporation and percolation in the flats between the ranches and the river. The area flooded averages about 5 square miles during June and July. The loss by evaporation during this period from a shallow pan in soil was about 24.5 inches, and as the conditions are similar this amount represents approximately the loss from shallow flood water. The volume expressed as a continuous flow for two months is 55 second-feet, or for a year 9 second-feet. The other 9 second-feet can be assumed to represent the percolation from this flood water. It is not a permanent addition to the ground-water supply, however, for the surface of saturation is only a few feet below the ground surface in this area, and evaporation from damp soil and transpiration from natural vegetation soon reduce the ground-water surface to its normal position.

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SUMMARY.

The four sources of ground water are percolation from d cipitation, from stream flow, from irrigation, and from flo in the valley floor.

The first of these yields about 44 second-feet, of which 61 is from the intermediate mountain slopes, 30 per cent from wash slopes, and 9 per cent from the valley floor. Percolat streams yields about 79 second-feet, of which 68 per cent is ab ernment gaging stations and 32 per cent below. Irrigation second-feet and flood waters in the valley floor 9 second-fee

The total ground water is therefore 150 second-feet, probably 75 per cent reaches the deeper strata of the valley

GROUND WATER.

THE UNDERGROUND STORAGE RESERVOIR.

The aggregate voids in the porous alluvial material filling tom of the closed rock basin of the Independence region forn underground storage reservoir whose source of supply is pe from water occurring upon the surface of the valley fill. T be found in nature few better opportunities than this for the occurrence and behavior of water in such a reservoir. T defined sources of supply which it is practicable to measure, plicity of the geologic structure, the definite bounds withi ground water is confined, and the ideal climatic conditions f uring the natural outlets by evaporation are unique when c as in the region under investigation. The existence of grou in this reservoir will be considered as regards the formatio valley fill, the form and fluctuation of the ground-water surf the volume and outlets of the overflow.

FORMATION OF THE VALLEY FILL.

The alluvial material which forms the valley fill varies in s large bowlders to fine clay and in arrangement from a t mixture of all sizes to layers of well-assorted gravel, sand, a The transporting medium was water, both mountain stre Owens River taking part in the work. Some of the mat deposited in the beds and on the sides of shifting stream and much of the finer sand and clay was deposited from t waters of a large lake which occupied the lower portion of th The structure of the valley fill is therefore complex, and the c of the alluvial material underlying a given locality is di determine without actual examination from borings.

The only deep borings which have been made in the re those put down by the city of Los Angeles in connection

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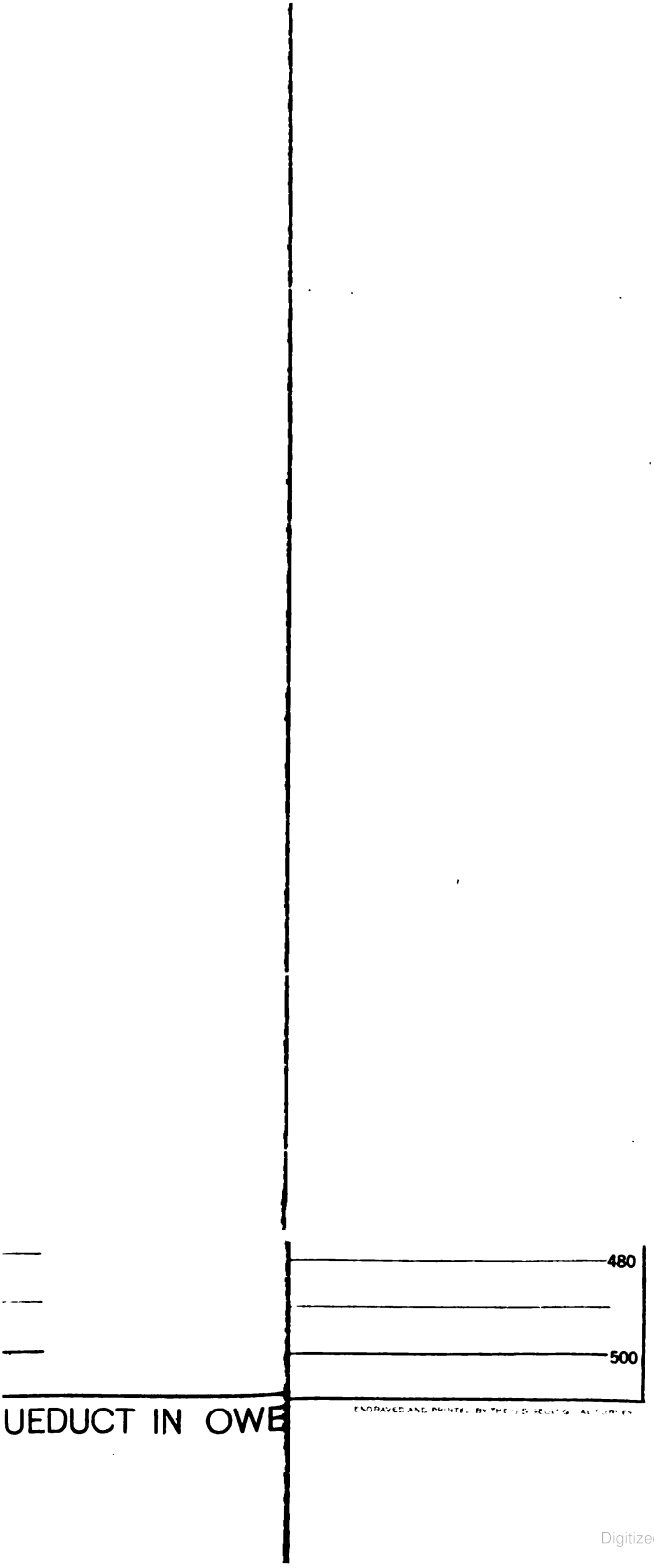

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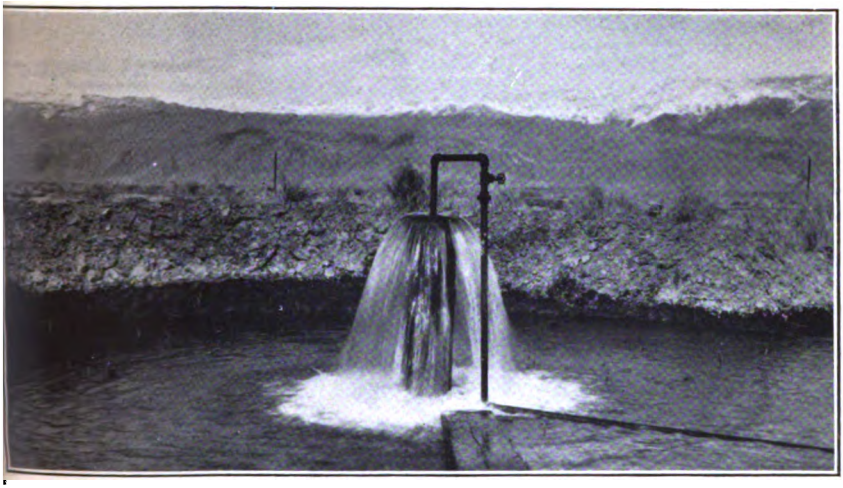

A. ARTESIAN WELL No. 2.

B. SIERRA NEVADA FROM THE VICINITY OF ARTESIAN WELL No. 2.

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development of the aqueduct supply. These are of the California or "stovepipe" type[1] and range in depth from 250 to 500 feet. Logs of these wells kept by the drillers as the work progressed are reproduced in Plate XXII. In general the material encountered was in layers of clay, sand, and gravel varying in thickness from a few inches to 150 feet. Reference to Plate XXV (p. 76), on which the geographic location of the wells has been platted, shows that relatively coarse material in thin layers interbedded with clay predominates along the upper edge of the valley floor in the spring belt. All wells located in this belt yield artesian flows of 1 to 2 second-feet. (See Pl. XXIII.) The material is progressively finer and occurs in thicker strata east of this belt, toward the center of the valley, and artesian flows decrease in volume. Near Owens River fine sand and clay in alternate layers is the only material encountered above 300 feet depth, except at the north end of the Alabama Hills. The color of the sands and clays near the river is bluish; those farther west are yellow.

The streams from the Sierra Nevada were by far the most active in the work of building up the valley fill. Their loads were acquired in the mountain canyons and carried out into the valley, where they were dropped in order of size as the velocity of flow decreased. The old lake level stood at an elevation of about 3,790 feet for a long period, as shown by beach lines on the east slope of the Alabama Hills. The present 3,790-foot contour lies near the spring belt, and it is very probable that the fine sands and clays underlying the area between the spring belt and Owens River are lake deposits. The entire absence of coarse material in this area is very significant, for the sudden checking of the velocity of a stream upon entering a body of still water results in the immediate deposition of gravel and coarse sand. The strata of coarse material encountered at the north end of the Alabama Hills in well No. 13 are derived from Hogback Creek, which flowed around the hills on a steep grade and entered the lake at this point. The barrier formed by the saturated lake deposits may therefore be the cause of the rise of water in springs and of the artesian flows encountered along the upper edge of the valley floor. Another explanation is the tendency for the coarser material to be deposited near stream channels and at points of sudden reduction in velocity due to flattening of the grade, while the finer material is carried out into the more level valley and into the regions between the alluvial cones.

Two cross sections of the valley showing the probable geologic structure of the region were constructed along the Thibaut and Independence sections (Pl. XXIV). The topography for these sections was obtained from the Geological Survey's map of the Mount Whitney

[1] Slichter, C. S., Field measurements of the rate of movement of underground waters: Water-Supply Paper U. S. Geol. Survey No. 140, 1905, pp. 98-103.

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quadrangle and the character of surface material was determined by field inspection. The exposed slopes of bedrock on either side of the valley were joined beneath the valley floor, and the arrangement of the material filling the basin thus formed was represented according to the best available knowledge, the strata of fine material being indicated by solid black. The greatest depth of alluvial filling in the Independence section measures 2,500 feet on the diagram and in the Thibaut section 1,800 feet. Two of the aqueduct wells near the Independence section reached depths of 500 feet in alluvial material, and a well being drilled by the Southern Pacific Co. opposite the Alabama Hills at Lone Pine station has reached a depth of 800 feet, entirely in fine sand. There is no reason to suppose that the gravel filling near Independence is less than 2,000 feet in depth.

The amount of void space, or porosity, of a body of alluvial material of this type is variously estimated by different authorities at 20 to 35 per cent of the total volume.[1] Samples of the mixed gravel, sand, and silt of the outwash slopes west of Independence were removed to a depth of 4 feet without disturbing the natural arrangement of the particles and weighed dry and after saturation. The results of these tests, as shown in Plate XXVIII (p. 82), indicate a porosity of 28 per cent for these samples. The presence of very coarse gravel and bowlders in this material would reduce the porosity, and for the valley fill as a whole 25 per cent is probably nearer correct.

An interesting feature of the valley fill of the Independence region is its total storage capacity for water. Its surface as represented by the outwash slopes and valley floor has an area of 230 square miles. On the assumption of an average depth of 1,000 feet of saturated alluvial débris beneath this area and a porosity of 25 per cent, the void space filled with water is 10.9 cubic miles, or 37,000,000 acre-feet. A portion of this water is capillary and not available for recovery from the ground. If one-fifth the total volume is assumed to be gravity water, there would be approximately 7,000,000 acre-feet which could be extracted from the underground reservoir, or a continuous flow of 3,200 second-feet for three years. This calculation has little practical bearing, however, for the average amount of water recovered from an underground reservoir with a well-planned and well-operated system of development would not exceed the natural overflow and also because of the prohibitive cost of constructing the necessary works.

[1] Mendenhall, W. C., Preliminary report on the ground waters of San Joaquin Valley, California: Water-Supply Paper U. S. Geol. Survey No. 222, 1908, p. 27. Hamlin, Homer, Underflow tests in the drainage basin of Los Angeles River: Water-Supply Paper U. S. Geol. Survey No. 112, 1905, pp. 29, 30, 31, 52.

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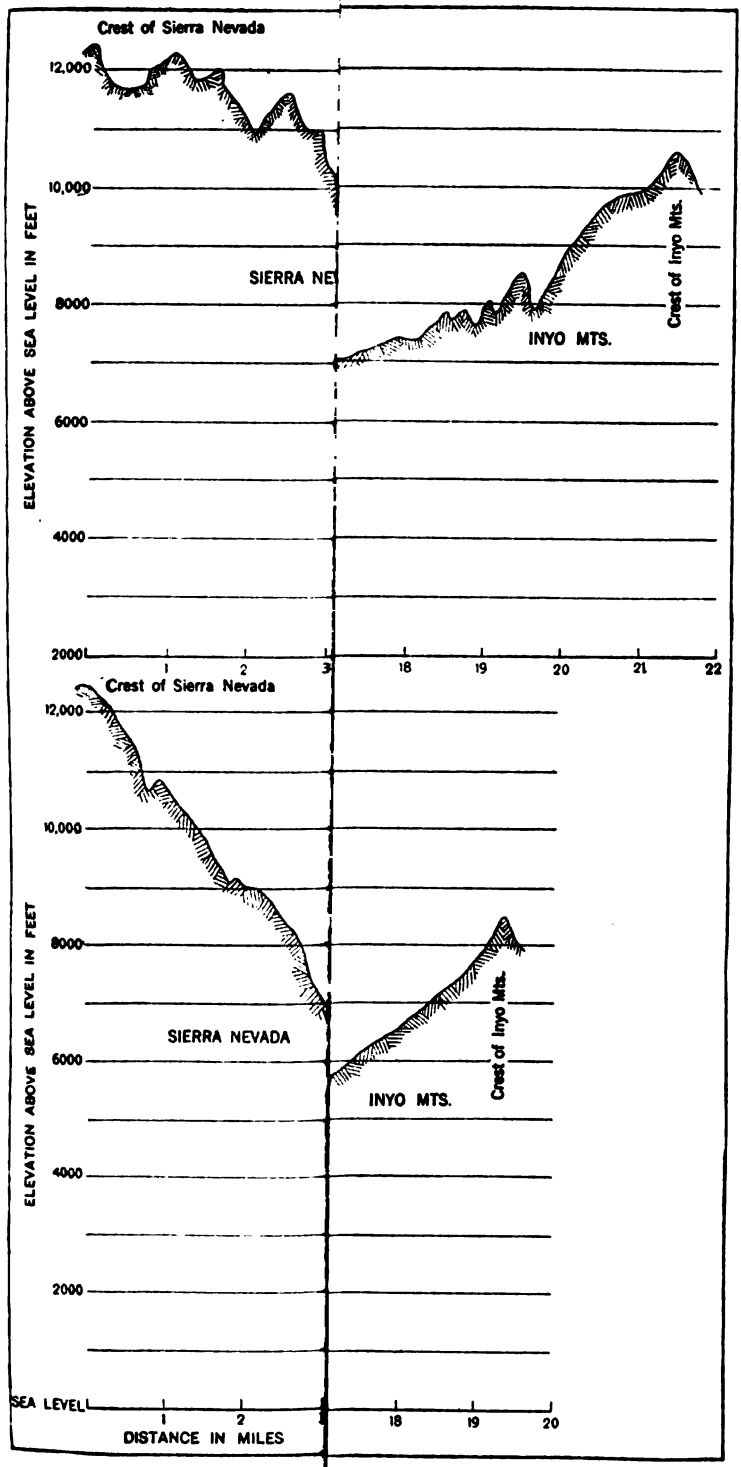

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FORM OF THE GROUND-WATER SURFACE.

The general form of the ground-water surface corresponds with that of the surface of the valley fill, although the slopes are less steep and the irregularities are not so pronounced. In the valley floor the depth to ground water is only a few feet. It becomes progressively greater toward the mountains and probably lies 200 or 300 feet beneath the outwash slope at about the 5,000-foot contour. Near the base of the mountains the alluvial material is shallow and ground water lies at moderate depths. Superimposed upon the general ground-water surface are sharp "ridges" beneath stream channels and "mounds" under irrigated fields. The surface of water in the underground reservoir is therefore not a level plain but has a varied topography.

There are two reasons for this condition—the action of gravity tending to equalize inequalities in the ground-water surface, and the resistance which the ground offers to lateral motion of water through its interstices. Percolating waters enter the valley fill from the upper edge of the outwash slope, from stream channels crossing the outwash slope, and from irrigated fields. The valley floor is the lowest portion of the valley fill and also the ground-water outlet. The force of gravity therefore tends to draw percolating water which has reached the surface of saturation to the level of the valley floor. This can occur only by a lateral movement of water from the outwash slope toward the valley floor, but the resistance of the porous material is so great that a steep gradient is necessary to maintain even a very low velocity. Hence there is the steep slope of the ground-water surface from the mountains toward the valley and laterally from stream channels and irrigated fields. The lateral movement of water is so slow that percolating water entering at the upper edge of the outwash slopes during a series of wet or dry years would not reach Independence for at least two years.

The position of the surface of water in a well, when there are no disturbing conditions, such as pumping, registers the position of the surface of ground water in the surrounding soil. In order to outline this surface definitely, all existing domestic wells in the region were located and many additional observation wells drilled where the cost was not prohibitive. The region contains 27 domestic wells, 12 of which are located on the valley floor and 15 on the outwash slopes. There were drilled 142 observation wells, all but two being located on the valley floor. These wells were sufficient to define the ground-water surface over about 60 square miles of the region. They are listed and described in Table 64 and their location is shown on Plate XXV.

The general arrangement of the wells is in parallel lines spaced from 1 to 2 miles apart and transverse to the axis of the valley.

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Where such wells did not sufficiently outline the ground-water c tours they were supplemented by intermediate wells. There 15 of these lines, or sections, each designated by name and c taining from 3 to 17 wells. The wells are designated by the ini letter of the name of the section and numbered consecutively, be ning with No. 1 at the west or east end of the section. The in mediate wells are numbered from 1 to 64, inclusive, without re to location. In Table 64 the wells are arranged from north to so and in each section or group of intermediate wells from west to The location of wells with respect to the land net was determine reference to existing fence lines or by stadia surveys. The elevat of ground surface and bench mark at each well were determ with an engineer's level. The descriptions of surface conditio Table 64 were prepared in the field during August, 1908, and re sent permanent conditions, except for surface alkali, which v during the year.

Observation wells described as "test holes" in Table 64 are 2 holes drilled with a specially designed spoon auger fitted with e sible handle. In the clay soil of the valley floor these holes indefinitely without caving and are practical to depths of abo feet. The type of auger used brings out a true sample of the ma encountered, so that accurate logs of each hole could be kept. H marks consisted of two stakes on opposite sides of the hole d nearly flush with the ground surface. Measurements of dep water surface were made from a cleat laid across the stakes. O vations of depth to water were made by lowering a chalked tape, weighted at the end, from the bench mark until the weigh submerged. Readings were to feet and hundredths.

The cross sections of the valley in Plate XXVI define the fo the ground-water surface below the 4,000-foot contour on Septe 20, 1909. The elevations of ground surface in these sections obtained with an engineer's level, and the distances by the s method. The ground-water surface was outlined by the me just described. In the sections the vertical scale has been gr exaggerated to bring out the detail. The ground-water surfa it approaches the valley floor from the west has an average slo 90 feet to the mile. The corresponding slope of the ground su is steeper, varying from 150 to 110 feet to the mile. At the edge of the grass land the two surfaces are about 8 feet apart, short distance beyond they intersect in the spring belt. Fro belt to Owens River the distance to ground water varies from 4 feet beneath the gently sloping or level valley floor. This s break in the slope of the ground-water surface at the spring caused by the change from coarse to fine material in the region old lake shore. The fine material acts somewhat like a dam, r

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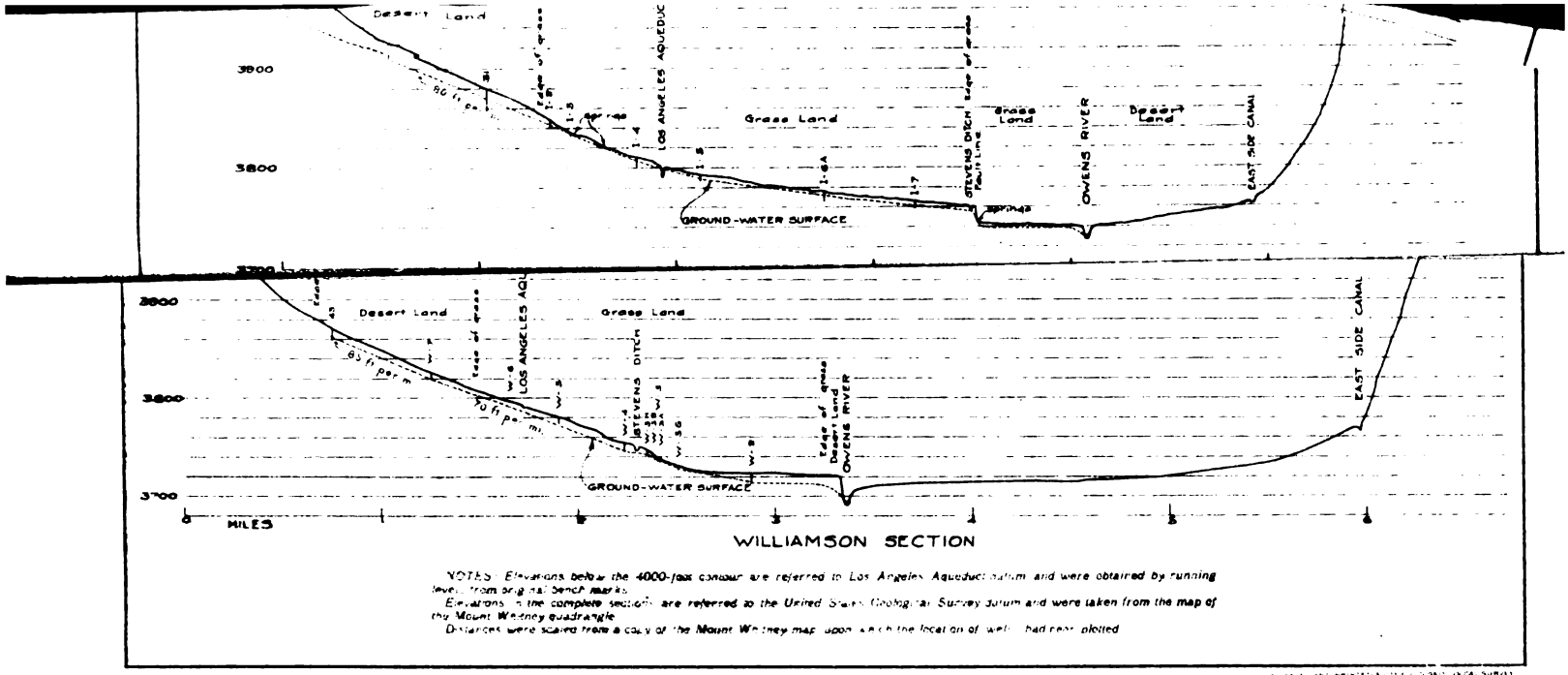

NOTES: Elevations below the 4000-foot contour are referred to Los Angeles Aqueduct datum and were obtained by running levels from original bench marks.

Elevations in the complete sections are referred to the United States Geological Survey datum and were taken from the map of the Mount Whitney quadrangle.

Distances were scaled from a copy of the Mount Whitney map upon which the location of wells had been plotted.

CROSS SECTIONS OF OWENS VALLEY, INDEPENDENCE REGION, CALIFORNIA, SHOWING PROFILE OF GROUND-WATER SURFACE BELOW 4000-FOOT CONTOUR ON SEPTEMBER 20, 1909

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a portion of the ground water to the surface in springs and retarding the lateral movement of the remainder.

Ground-water contours for the valley floor showing lines of equal average depth to ground water have been worked out on Plate XXV. They represent the average position of the surface of saturation between the extreme levels indicated in Table 65. The data are sufficient to determine the 3, 4, and 8 foot contours with reasonable accuracy. The sudden approach of ground water toward the surface at the upper edge of the grass land is shown, and also the general proximity of ground water to the surface throughout the valley floor. The total area between the westerly 8-foot contour and Owens River is 67 square miles. The average depth to ground water is between 4 and 8 feet over 40 per cent of this area, and between 3 and 4 feet over 28 per cent. It exceeds 8 feet over 14 per cent of the area and is 3 feet or less over 18 per cent. The area of the valley floor is 66.4 square miles (Table 1) and its west boundary practically coincides with the 8-foot contour. The nonirrigated area within the 3-foot contour is 11.89 square miles, between the 3 and 4 foot contours 17.66 square miles, and between the 4 and 8 foot contours 25.04 square miles.

There is a very striking relation between vegetation and depth to ground water. On the outwash slopes the vegetation consists of various stunted desert shrubs. In approaching the valley floor at about the 20-foot contour, sagebrush (*Artemisia*) begins to predominate and has a luxuriant growth as far east as the 12-foot contour, where it is replaced by greasewood, rabbit brush, and coarse bunch grass. In the vicinity of the 8-foot contour salt grass (*Distichlis spicata*) begins to appear, and farther east, near and within the area inclosed by the 4-foot contour, it grows luxuriantly. Within the 3-foot contour fresh-water grasses thrive where there is sufficient surface water to leach out and carry away most of the alkali, but the salt grass grows well even where the soil is alkaline. In various portions of the valley floor rabbit brush and greasewood are found where the average depth to ground water is 4 feet or more, but grass predominates east of the 8-foot contour. In areas where the alkali is excessive there is practically no vegetation. In general, grass does not grow where the depth to ground water exceeds 8 feet, so the 8-foot contour tends to coincide with boundaries between meadow and desert lands.

A fault plane in the valley floor (Pl. XXV), along which vertical and horizontal movement of the earth's crust occurred during the earthquake of 1872, gives rise to some interesting local ground-water conditions. A permanent result of these movements was the formation of a crack extending in a generally straight line parallel with Owens River from a point 1½ miles north of Citrus bridge to the river

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opposite Aberdeen. Along this crack there still remain sunken areas and bluffs. The sunken areas form closed basins whose bottoms are either intermittently or permanently below ground-water surface and hence are flooded with seepage water. The deeper basins are permanent lakes without surface inlet or outlet, but the shallower basins contain water only during highest ground-water stages and are green meadows at other times. These lakes and meadows are in marked contrast to the immediately surrounding country, over most of which the depth to ground water exceeds 8 feet and desert conditions prevail. Goose Lake is an example of a permanent ground-water lake; the lake south of Citrus bridge in the lake section is intermittent.

The bluffs range from slight breaks in the surface to steep banks 12 feet in height. At the bases of these bluffs there are numerous

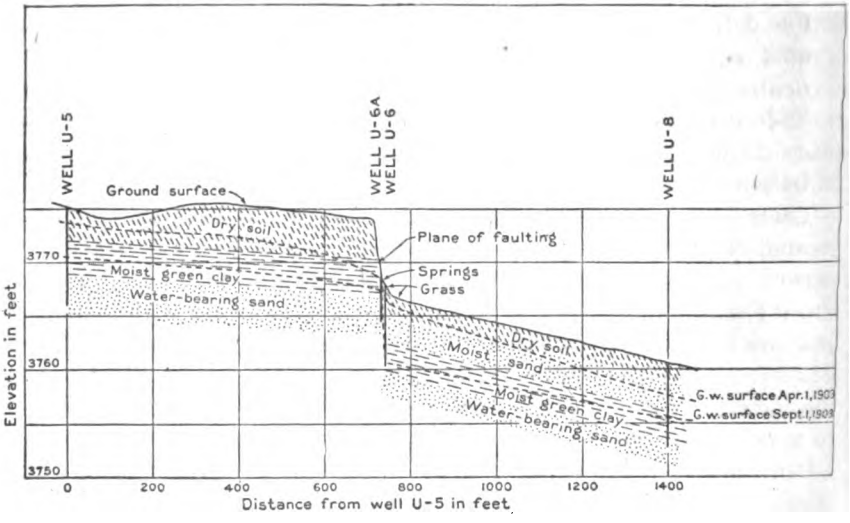

FIGURE 8.—Ground-water conditions at intersection of the University Peak section in the earthquake *rift* of 1872.

springs, and seepage water appears in sufficient quantity to keep green a narrow strip of meadow grass. This condition results from the exposure of the broken edge of a water-bearing stratum, as shown in figure 8. The crossings of the fault line with the Oak, Independence, and Citrus sections are similar to that of the University Peak section shown in the diagram.

FLUCTUATIONS OF THE GROUND-WATER SURFACE.

The surface of ground water is continually fluctuating. Both the amount and character of this fluctuation vary widely in different localities and at different times, depending on the proximity to ground-water sources or outlets and the relative rates of ground-water accretion and depletion. Three pronounced types are to be observed in

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Independence region—(1) broad irregular fluctuations of varying amplitude in the outwash-slope area; (2) slightly irregular periodic fluctuation with wide fixed limits in and near irrigated areas; and (3) a regular periodic fluctuation with comparatively narrow and fixed limits in the valley floor. Special characteristics are also exhibited by wells within certain limited areas, as the result of local ground-water conditions.

These fluctuations were determined and studied from well observations made by the methods already described. Readings obtained at intervals of two to four weeks were sufficient to establish accurately the position of the ground-water surface at all times, as the fluctuations are characterized by exceptional regularity. Most of the wells listed in Table 64 were observed from August 15, 1908, to November 15, 1909, and on 26 of the most typical wells observations were continued to May 1, 1911. The fluctuation of the surface of the lake south of Citrus bridge was observed from August 15, 1908, to November 15, 1909, and of Goose Lake from August 15, 1908, to May 1, 1911.

The type of fluctuation peculiar to wells located on the outwash slope is shown in Plate XXVII by wells Nos. 31, 64, 25, 26, and 59 and Citrus No. 1. Water stands 10 feet or more below the surface in all these wells, the vegetation of the surrounding area is limited to desert shrubs, and there are no alkali deposits on the surface. With knowledge of the sources and movement of ground water beneath the outwash slopes, the assigned cause for this type would be annual variation in the amount of water supplied by percolation from precipitation on the intermediate and outwash slopes and from stream channels. This is confirmed by the observations. For example, well No. 31, which is situated 7 miles from the base of the Sierra and 500 feet south of the old channel of Pinyon Creek, exhibits a persistent downward tendency which was partly checked during the summer months of 1909 and 1910. The maximum effect of the very wet years 1906 and 1907 evidently reached this well in 1908 and early 1909. During the following years the water had a tendency to return to its normal level. This was twice opposed by percolation from the channel of Pinyon Creek, which carried flood water during a few weeks in June and July, 1909, and for a very short period in 1910. Citrus well No. 1, which is about three-quarters of a mile south of well No. 31, has similar fluctuations, but in this well the maximum effect of seepage from Pinyon Creek is registered six weeks later in 1909 and in 1910 is much smaller in amount. Well No. 64, situated similarly with respect to the mountains, but north of Little Pine Creek, has the same downward tendency, which is temporarily checked during the summer by irrigation in an adjacent alfalfa field and a small garden at the well. Well No. 59, which is 2 miles from the base of the Sierra and half a mile south of Sawmill Creek, had an upward tendency

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during 1909, due to the percolation from precipitation of th winter 1908–9. In 1910 the water level fell in response to th mal winter 1909–10. Seepage from Sawmill Creek does not this well appreciably. Wells Nos. 25 and 26 exhibit the g tendencies of well No. 59, but they are situated in the transitio between the outwash slope and valley floor, where there is a pe backwater effect from the annual rise of ground water in the gras

Wells Nos. 61 and 62 illustrate the type of fluctuation char istic of the irrigated areas of the region. They are located i gated gardens in the town of Independence. The form of the is periodic, with sharp crests and troughs, the former in Jul latter in January or February. The amount of fluctuation in wells ranges from 10 to 20 feet in different portions of the r Irregularities superimposed upon the broad periodic curve a result of irregularity in the application of irrigation water. general form of the curve, however, corresponds to the a intensity of irrigation.

The fluctuation of ground-water surface in various parts valley floor, other than at eight wells already mentioned, is by 48 typical well records in Plate XXVII. Most of these we located where the average depth to ground water is less than The adjacent ground surface is more or less crusted with alkal where the alkali is not too concentrated several species of wild grow vigorously. (See Table 64.) The two lakes and wells No and 43 are located in areas where the average depth to ground exceeds 8 feet and desert conditions prevail.

The character of the fluctuations observed in all the valle wells is remarkably uniform. When platted the observation smooth and regular lines of the sine-curve type, with an a periodicity. The average time of occurrence of crests for well ated in grass or alkali areas is March 15; the troughs occur Sept 15, six months later. Heavy winter precipitation or the pro of springs advances the crests into January or February, but desert areas the crest lags into April or May. (See Tables 64 an The amount of fluctuation between maximum and minimum in normally situated wells ranges from 1.5 to 4 feet. Wells si near or below springs in the vicinity of intermittently occurrin face water have a greater range, which may reach 7 feet. The age amount of fluctuation for 1908–9 as observed in 122 wel tributed generally over the valley floor is 3.14 feet. (See Tab This average represents normal conditions.

Fluctuation of this type is due to evaporation from the so transpiration, processes which are active wherever there is ca connection between the surface of saturation and the ground s or wherever gravity water or capillary water is within reach of

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roots. Two general conditions have led to this conclusion—(1) the area characterized by capillary connection between ground-water surface and ground surface and by accessibility of ground water to plant roots is coincident with the area exhibiting this type of periodic fluctuation; and (2) the combined rates of evaporation from soil and transpiration as observed experimentally increase and decrease concurrently and in the same ratio with the fall and rise of the ground-water surface.

The first of these conditions is indicated by the following facts. Surface incrustations of alkali are now known among investigators to be an indication of evaporation from the soil, and a growth of natural grasses certainly shows the presence of water within reach of plant roots. These manifestations are both strictly confined to valley-floor areas within which the periodic fluctuation is observed. There are valley-floor areas, however, within which the periodic fluctuation occurs but which have a loose sandy surface devoid of alkali and vegetation. An examination of such areas shows that they are surrounded or bordered by meadow and alkali-crusted land, and further that maximum and minimum ground-water levels exhibit a lag in time of occurrence which varies with the distance from these adjacent lands. (See Pl. XXVII, well C-3 and Goose Lake.) The fluctuations in these desert areas do not originate within the areas themselves but in the adjacent lands, from which they are propagated as annual waves. In general, average depths to ground water exceed 8 feet in desert areas but are less than 8 feet in meadow or alkali lands.

Studies of the available pore space in the soil above the ground-water surface are of interest in this connection (Pl. XXVIII). In October, 1909, about a month after the period of minimum ground-water level, a number of samples of soil in various parts of the valley floor and at various depths were tested to determine their capacity for absorbing water. The samples were about one-eighth cubic foot in volume and were taken at intervals of 1 to 2 feet from the ground surface to the surface of saturation, the depth below ground surface being measured to the center of gravity of the samples. Samples which would hold together under water were cut into squared blocks 6 inches on an edge; those which showed signs of disintegrating were taken out in a sheet metal ring 8 inches in diameter and 6 inches long provided with a cutting edge, and the open ends squared off. In the process of submerging the samples, they are placed on sheet-metal plates and cylindrical samples were not removed from the casing. The samples were weighed to ounces immediately after removal from the ground and were then submerged in water until completely saturated, when they were weighed again. The difference in weight

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expressed as an equivalent volume of water divided by the me volume of the sample was assumed to give the percentage of av pore space. The results of this study are presented in Plate X for each test pit and include a description of surface conditio material encountered in the excavation, the existing ground-wat and its maximum and minimum positions, and the relation of below ground surface and available pore space. The diagrams unmistakably the phenomenon observed by King in studying t tribution of moisture in saturated soil columns after long sta namely, that there is a uniform decrease of moisture from the s of saturation to the upper limits of capillary action.[1] They further that where the average depth to ground water does not e 8 feet the upper limits of capillary action are near the ground su but that where it is greater than 8 feet the connection with the s is broken and the upper limits of capillary water fall to a level the surface. (See results for test pits Nos. 6 and 9.) Thi explains the occurrence of alkali crusts only where the depth to g water is less than 8 feet, and also supports the observation m connection with the experiments on evaporation from soil that e ration does not occur from ground water where the depth ex 8 feet.

The second condition—that variations of soil evaporatio transpiration are similar to ground-water fluctuations—is indi by the results of the experiments on evaporation from soil. maximum rate of soil evaporation occurs between September 15 and the minimum between March 15 and 30. Lowest gro water level occurs about September 15 and highest level on Mar (Pl. XXIX). Thus critical points in curves of soil evaporatio ground-water fluctuation are practically coincident as regards Furthermore, although the curves are inversely related, their is remarkably similar. The natural conclusion is that ground-w fluctuations in nonirrigated portions of the valley fill are the r of evaporation from the soil and transpiration.

Variations from the normal periodic curves occur for three caus large precipitation, seepage from springs, and seepage from stan or flowing surface water. The infrequency of precipitation suffi to raise the ground-water surface is shown on Plates XXVII XXIX. It is practically a negligible factor in ground-water fluc tions. The springs at the upper edge of the outwash slope a ground-water conditions in their vicinity by stimulating the an rise and maintaining the ground-water level at a maximum du several months prior to March. (See Pl. XXVII, wells Nos. U–6A, and I–4.) This results from the decrease in the rate of evaporation which allows accumulation of their discharge in the

[1] King, F. H., Sixteenth Ann. Rept. Wisconsin Exper. Sta., 1899, p. 24.

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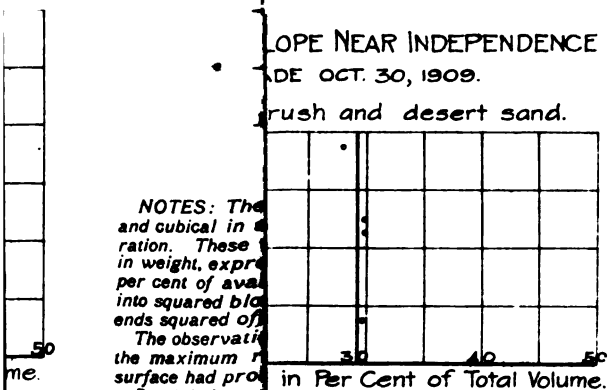
LOPE NEAR INDEPENDENCE
DE OCT. 30, 1909.
rush and desert sand.



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rounding soil at a greater rate than in adjacent areas where the rate of supply of underground water is less. Surface water has its source in large springs, waste from irrigation, and flood waters of mountain streams. It occurs at various times and places and can not be considered as a permanent factor in ground-water fluctuations. (See Pl. XXVII, wells Nos. 4, 38, 39–A, 32, and GL–1.) The irregular fluctuations of ground water on the outwash slope do not appear in the valley floor because of the relief afforded by the escape of water in springs at the upper edge of the grassland.

The volume of water represented by the annual rise and fall of the surface of saturation in the valley floor is of interest in a study of the ground-water yield. The area of the valley floor, exclusive of irrigated land, within which the periodic fluctuation is observed is 63.8 square miles, of which 9.18 square miles is desert land. The average amount of fluctuation in ground-water level observed over the 63.8 square miles is 3.14 feet, which is equivalent to 3.67 feet over the evaporating area of 54.6 square miles. The depth of water represented by this fluctuation depends on the available pore space in the soil layer, which is alternately filled and drained. At maximum ground-water level this layer is saturated, but at minimum level it is drained of gravity water and capillary spaces are shrunken. It is therefore necessary to know the amount of available pore space in the layer at lowest ground-water level in order to compute the depth of water represented by the observed rise. The diagrams of Plate XXVIII show this percentage at various depths five weeks after the lowest level of 1909. The available pore space in the region of fluctuation then varied from 5 to 15 per cent and averaged about 10 per cent. On the assumption that at lowest ground-water level the average was 25 per cent, the depth of water represented by a fluctuation of 3.67 feet is 11 inches. The average depth to ground water in the area of the valley floor (exclusive of irrigated land) from which evaporation occurs is 4.2 feet. Figure 5 (p. 59) shows the difference between summer and winter evaporation at this depth to be 14 inches. The true value is therefore probably close to 12 inches.

GROUND-WATER YIELD.

Ground-water fluctuations within the valley floor consist primarily of the regular annual rise and fall produced by variation in the rate of evaporation. This is indicated by actual observations extending over three years and confirmed by the persistency of various perennial plant species. Hence there must be overflow of ground water from the valley fill of the region in general equal to inflow by percolation. The possible outlets would seem to be underflow southward through the valley fill, underflow by way of deep fissures, seepage, and spring flow into the channel of Owens River, evaporation from spring waters,

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evaporation from damp soil, and transpiration from vegetation. The first two of these are eliminated by the geology of the region. The slope of the ground-water surface in the valley fill opposite the Alabama Hills does not exceed 8 feet to the mile, and the material is fine sand and clay, as indicated by the Southern Pacific Co.'s well at Lone Pine station. Even if there is a movement of ground water southward from the region, it must be exceedingly slow and it would be entirely intercepted by the alluvial fan of Lone Pine Creek, which has a ground-water surface higher than the valley fill to the north. The swampy land in the valley floor opposite the north end of the Alabama Hills is also proof that underflow southward is negligible. The granitic formation of the Sierra Nevada and the granite core of the Inyo Mountains are complete barriers against the escape of underground waters through any formation but the valley fill. It has already been shown that there is no seepage flow into Owens River from the water supply of the region, and the outlets by evaporation, transpiration, and spring discharge into Owens River are all that remain to be considered.

Soil evaporation and transpiration will be discussed first for irrigated lands and second for the general grass and alkali area of the valley floor (Pl. XXX). The amount of water used in irrigating the 3,011 acres under cultivation in the region is about 72 second-feet continuous flow for six months (Table 63), which is equivalent to a depth of 8.6 feet over the whole area. The depth of transpiration from alfalfa during the irrigating season has already been computed as 3.43 feet, or 40 per cent of the total volume used. There is also a small loss through evaporation from the soil during and immediately after irrigations, say 0.85 foot, or 10 per cent of the total. The total loss by evaporation from the soil and transpiration from irrigated areas is therefore 4.3 feet in depth, or 18 second-feet continuous flow.

The bases for computing the evaporation and transpiration loss from grass and alkali land are the soil-evaporation equations of figure 5 and the ground-water contours of Plate XXV. The equations were developed for fixed ground-water surface, but they cover the periods October 1 to March 31 and April 1 to September 30, which practically coincide with the observed periods of rising and falling ground water. Hence, to cover the natural conditions of fluctuating ground-water surface, average annual depth to ground water at a given point can be substituted in the equations instead of fixed ground-water depths. The average annual depth to ground water in feet and the depth of evaporation as determined from the equations applying during the season 1910–11 are given in Table 66 for the nonirrigated areas inclosed by the 3-foot contour and between the 3 and 4 foot and 4 and 8 foot contours. The volume annually

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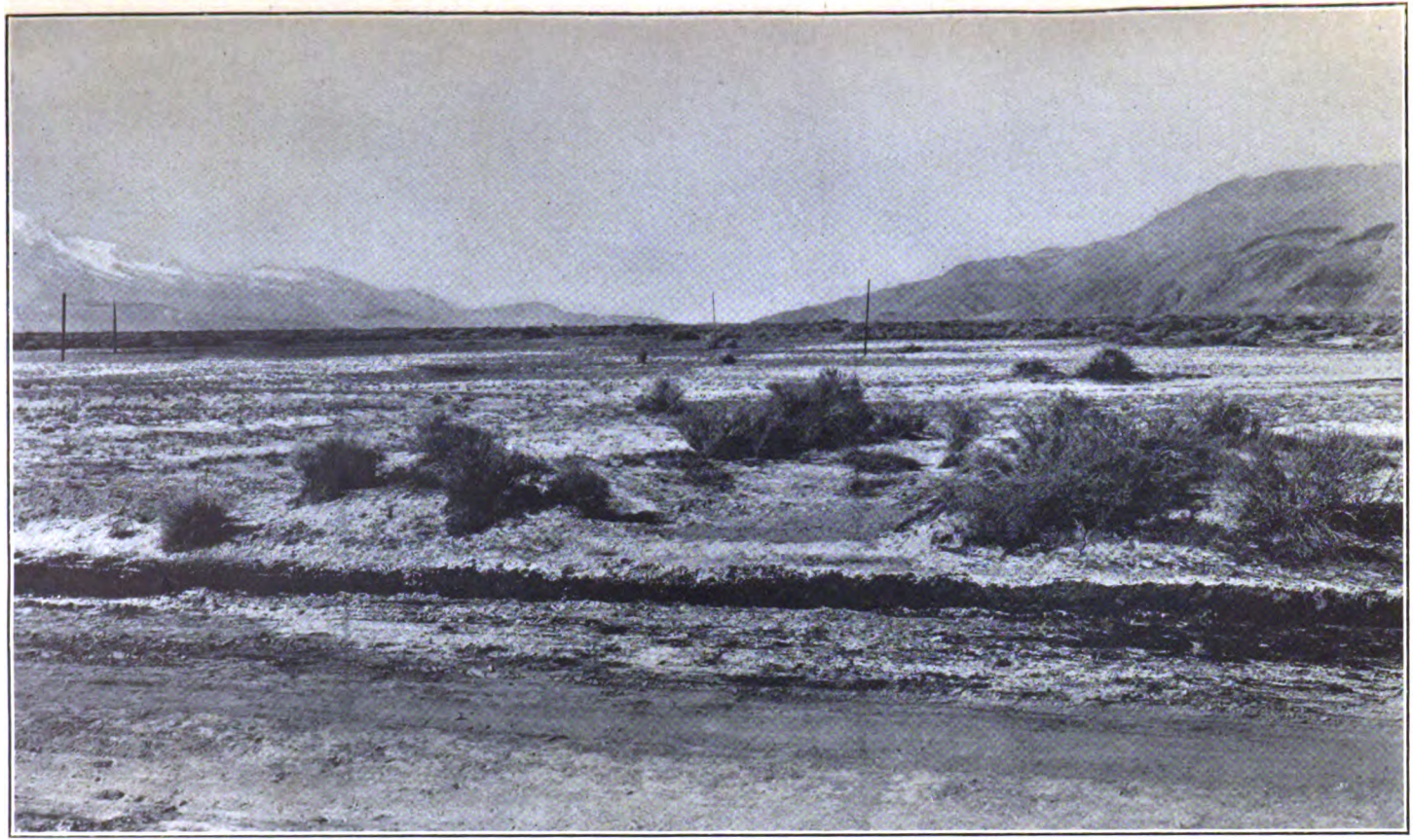

VIEW OF VALLEY FLOOR, SHOWING GRASS AND ALKALI LANDS FROM WHICH EVAPORATION HAS TAKEN PLACE.

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aporating from the whole area inclosed by these contours is equivalent to a continuous flow for the year of 93 second-feet. The total volume evaporating from this area as computed by use of the assumed equations is 114 second-feet. The first of these quantities is believed to be too small, and it is possible that the second is too large.

The water of Blackrock and Hines springs and of the small springs along the upper edge of the valley floor spreads out in many shallow lake basins before reaching Owens River. The loss by evaporation from the surface of these lakes is large. Estimates based on the area of water surface exposed and the evaporation from water in the shallow pan in soil indicate that about 50 per cent of the flow of these springs thus escapes into the atmosphere. As the combined flow is 31 second-feet, the loss by evaporation from free water surface is 15 second-feet. The remaining portion which does not flow into Owens River percolates into the soil and escapes by evaporation from the soil and transpiration.

Two springs deriving their waters from percolation discharge directly into Owens River; these are Upper and Lower Seeley springs. Their combined average flow is 11 second-feet. In addition the Blackrock Springs discharge an average of 7 second-feet into the river during the months November to March, inclusive, which is equivalent to a continuous flow of 3 second-feet. The total discharge into the river from springs is therefore 14 second-feet.

The total ground-water yield is thus greater than 140 second-feet and equal to or less than 161 second-feet. In the opinion of the writer experiments extending over the calendar year 1911 would establish the value as 155 second-feet.[1]

SUMMARY.

1. The structure of the valley fill is favorable for the underground storage of water.

2. The ground-water surface lies within a few feet of the ground surface throughout the valley floor. West of the spring belt it rises with a slope of about 90 feet to the mile, which is less than the slope of the ground surface.

3. Fluctuations of the ground-water surface are caused by variations in ground-water supply in the outwash-slope area and in irri-

[1] The results of experiments on evaporation from the soil for the calendar year 1911, which have become available since the foregoing was written, show an increase of about 17 per cent over the evaporation observed for the period June 1, 1910, to May 31, 1911. This increase is probably due to the fact that the conditions in the soil tanks during 1911 were more nearly as they are in nature. A further though smaller increase is to be expected during 1912. The results of the observations during 1911 indicate that the evaporation and transpiration from grass and alkali land areas of the Independence region was equivalent to a continuous flow of 109 second-feet. It appears therefore that the total ground-water yield of this region is approximately 155 second-feet.

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gated portions of the valley floor. In nonirrigated portions of the valley floor they are caused primarily by variations in natural ground-water yield.

4. The total ground-water yield is 155 second-feet, distributed as follows: Soil evaporation and transpiration from grass and alkali lands of the valley floor, between 93 and 114 second-feet; soil evaporation and transpiration from irrigated land, 18 second-feet; evaporation from spring flow, 15 second-feet; and discharge of springs into Owens River, 14 second-feet.

5. The available data indicate the equality of ground-water supply and yield.

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TABLES.

TABLE 1.—*Subdivisions of Independence region.*

Subdivision.	Area.		Boundary.		Slope.	Vegetation.	Character of surface.
	Square miles.	Per cent of total.	Upper.	Lower.			
High mountain drainage.	95.8	27	Sierra crest..	Mouth of canyon.	Precipitous to gentle.	Isolated forest trees.	Bare granite and fragmental rock accumulations.
Intermediate mountain slope.	29.4	8	Canyon drainage.	6,500-foot contour.	2,000 to 3,000 feet to the mile.	Desert bushes and nut pine.	Fragmental and finely disintegrated rock accumulations.
Outwash slope...	165.3	46	6,500-foot contour.	Grassland.	300 to 600 feet to the mile.	Desert bushes.	Bowlders, sand, and gravel.
Valley floor:							
Cultivated...	4.7	1	.....	.....	Gentle.....	Alfalfa, etc....	Soil.
Meadow.....	45.1	13	.....	.....	Gentle to level.	Salt grass, etc.	Do.
Alkali.....	2.7	1	.....	.....	Level.....	None.....	Do.
Desert.....	13.9	4	.....	.....	.....do.....	Desert bushes.	Fine sand.
	356.9	100					

TABLE 2.—*High mountain drainage areas of Independence region.*

Creek.	Area.		Elevation.		Shape.	Length of Sierra crest drained.	Remarks.
	Total.	Per cent above 10,000 feet.	Head of canyon.	Mouth of canyon.			
	Sq. mi.		*Feet.*	*Feet.*		*Miles.*	
Taboose.....	6.99	60	12,000	6,500	Triangular..	3.34	Morainal deposits; regulated run-off.
Goodale.....	4.97	69	12,500	6,500	.....do.....	2.67	Do.
Dry Canyon.....	2.48	65	12,000	6,500	.....do.....	1.21	Morainal deposits; no surface run-off.
Division.....	3.88	51	12,000	6,000	Rectangular.	1.88	Morainal deposits.
Sawmill.....	7.64	44	12,000	5,000	.....do.....	2.75	
Thibaut (N. Fk.)..	2.25	20	11,500	6,000	Irregular....	0.0	
Thibaut (S. Fk.)..	2.62	55	12,000	6,000	.....do.....	0.0	
Oak (N. Fk.).....	8.08	65	12,500	6,000	.....do.....	5.17	Morainal deposits; regulated run-off.
Oak (S. Fk.).....	7.28	57	12,500	6,000	.....do.....	1.06	
Little Pine.....	8.42	74	13,000	6,500	Triangular..	4.60	
Pinyon.....	4.29	47	13,000	6,500	Irregular....	1.09	
Symmes.....	4.22	43	13,000	6,300	Triangular..	1.59	
Shepard.....	12.29	66	13,500	6,500	.....do.....	7.95	5.68 miles of crest south of Kings-Kern divide.
Bairs (N. Fk.)....	4.01	43	13,500	6,300	Irregular....	0.0	Lies on east face of Mount Williamson.
Bairs (S. Fk.)....	2.90	41	13,000	6,300	.....do.....	0.0	Do.
George.....	9.10	74	13,500	6,500	Triangular..	3.89	
Hogback.....	4.38	58	13,000	7,000	Irregular....	0.67	
	95.80	55	.....	.....	.....	37.87	

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TABLE 3.—*Intermediate mountain slopes of Independence region.*

Adjacent high mountain drainage areas.	Area.	Elevation.			Distance from Sierra crest to center of area.	Remarks.
		Apex.	Center of area.	Lower border.		
	Sq. miles.	*Feet.*	*Feet.*	*Feet.*	*Miles.*	
Tinemaha	2.17	(11,000)	8,000	6,500	3.0	
Red Mountain	2.37	(12,000)	8,300	6,500	3.0	
Taboose	3.94	12,200	8,000	6,500	3.3	
Goodale	2.29	11,800	7,200	6,500	2.6	Does not include Dry Canyon.
Division	.95	9,500	7,500	6,500	3.5	
Sawmill	1.32	10,200	7,500	6,500	3.2	
Thibaut (North Fork)	.53	10,500	7,500	6,500	3.1	
Thibaut (South Fork)	.07	7,000	6,700	6,500	4.0	Charlies Canyon yields run-off in normal and above normal years.
Oak (North Fork)	3.62	12,600	7,100	6,500	4.2	
Oak (South Fork)	1.03	10,600	7,100	6,500	3.8	
Little Pine	2.02	11,800	7,400	6,500	3.8	Lime Fork yields run-off in normal and above normal years.
Pinyon	2.89	11,500	7,600	6,500	2.7	
Symmes	.42	9,200	7,400	6,500	3.2	North Fork similar to Lime Fork.
Shepard	.97	9,900	7,200	6,500	4.5	
Bairs (North Fork)	.48	9,100	7,100	6,500	5.0	
Bairs (South Fork)	1.21	10,300	7,800	6,500	4.6	
George	2.09	11,200	8,100	6,500	3.5	
Hogback (one-half)	1.08	10,800	7,900	6,500	4.1	
	29.45	.....	.....	.....	.....	

TABLE 4.—*Precipitation in inches at Independence, Cal.*

[1865–1877, U. S. War Dept., Fort Independence, elevation, 3,930 feet; 1892–1895, and 1898–1910, U. S. Weather Bur., Independence, elevation, 3,920 feet.]

Season.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1865–66	.....	.....	0	0.65	2.42	0	0	0.16	.....	.....	.....	.....	.....
1866–67	0	0.32	0	2.27	0	1.63	4.76	.53	0.76	0	0.01	1.15	11.43
1867–68	0.07	.32	0.21	12.19	5.46	0	0	.40	.71	0	.10	0	19.46
1868–69	0	.74	.44	1.17	.16	0	.32	.11	.36	0	.03	0	3.33
1869–70	0	0	.14	0	.20	1.36	0	.21	.27	0	.35	.10	2.63
1870–71	0	1.10	0	1.00	0	1.28	0	0	0	0.30	0	0	3.68
1871–72	0	0	.65	4.70	0	.30	.28	.55	.18	0	.28	.12	7.06
1872–73	0	0	0	1.18	0	.40	0	0	0	0	0	.05	1.63
1873–74	.10	0	0	3.40	2.40	1.00	0	0	0	.01	.15	0	7.06
1874–75	.40	.80	.40	0	1.73	0	0	0	0	0	0	0	3.33
1875–76	.01	0	.66	.62	1.51	.70	.87	0	0	.15	.19	.56	5.27
1876–77	.16	.26	0	0	.76	0	0	.59	.69	0	0	0	2.46
1891–92	.....	.....	.....	.....	.....	.....	.62	.....	.96	.07	Tr.	Tr.	.....
1892–93	0	.35	.23	1.61	1.51	2.91	.98	.02	Tr.	0	.77	Tr.	8.38
1893–94	Tr.	0	.10	.75	.12	.42	.09	.02	.10	.11	.12	.51	2.34
1894–95	Tr.	0	0	1.89	1.24	1.18	.12	Tr.	.01	Tr.	Tr.	.04	4.48
1895–96	Tr.	.83	.67	.08	1.67	0	.....	.....	.....	.....	.....	.....	.....
1897–98	.....	.....	.....	.....	.....	.....	0	.16	.23	Tr.	Tr.	.11	.....
1898–99	.20	0	.10	.20	.54	Tr.	.01	.02	.03	.37	.01	.06	1.54
1899–1900	Tr.	.30	.85	.56	.31	.05	.67	.62	.22	.04	.08	Tr.	3.70
1900–1901	.75	.01	1.34	.13	2.81	.64	.05	Tr.	.36	0	.10	.32	6.51
1901–2	0	.65	.22	.06	.04	1.69	1.05	.17	.04	.01	.17	.13	4.23
1902–3	Tr.	.08	.41	.04	.71	.27	.34	.19	Tr.	.02	0	0	2.06
1903–4	Tr.	.42	Tr.	0	Tr.	1.20	.95	Tr.	.02	0	Tr.	.07	2.66
1904–5	.32	.06	0	Tr.	.54	.73	2.08	Tr.	.25	0	0	Tr.	3.98
1905–6	.25	0	.43	Tr.	2.89	.13	1.86	.36	.42	.10	.31	.04	6.79
1906–7	0	0	.02	.84	.95	.56	1.10	.14	.01	.55	Tr.	0	4.17
1907–8	0	2.12	Tr.	.42	1.63	.98	.14	Tr.	Tr.	Tr.	.26	.46	6.01
1908–9	.84	.03	.01	.20	3.27	2.73	.16	.12	Tr.	Tr.	0	.25	7.61
1909–10	.07	.01	.19	3.90	.25	Tr.	.10	.31	0	0	.27	0	5.10
26-year mean	.12	.29	.25	1.43	1.12	.77	.61	.17	.17	.06	.12	.15	5.26

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TABLE 5.—*Los Angeles aqueduct precipitation stations near Independence, Cal.*

[For location of gages see Plate I, p. 10.]

No. of gage.	Group.	Elevation of gage above sea level.	Distance to gage from crest of Sierra.	Topographic location of gage.	Dates of record (inclusive).
		Feet.	*Miles.*		
1	.....	3,820	8.0	On valley floor	Oct., 1908–Apr., 1909
1A	.....	3,880	7.5	....do	Sept., 1909–Aug., 1910
2	Taboose	4,070	8.1	Edge of valley floor	Oct., 1908–Aug., 1910
3	...do	4,460	6.9	On outwash slope	Oct., 1908–Aug., 1910
4	...do	5,040	5.5	....do	Oct., 1908–Aug., 1910
5	...do	5,550	4.7	At base of mountain	Oct., 1908–Aug., 1910
6A	...do	6,190	4.2	On ridge south of Taboose Creek	Oct., 1908–Feb., 1909
6	...do	6,190	4.2	On slope of mountain	Jan., 1909–Aug., 1910
18	Oak	3,735	13.8	Bank of Owens River	Sept., 1909–
17	...do	3,775	12.5	On valley floor	Apr., 1909–
7	...do	3,940	9.6	Edge of valley floor	Oct., 1908–
8	...do	4,300	8.4	On outwash slope	Oct., 1908–Aug., 1909
8A	...do	4,500	8.0	....do	Sept., 1909–
9	...do	5,030	6.6	....do	Oct., 1908–
10	...do	5,590	5.7	....do	Oct., 1908–
11	...do	6,120	4.8	At base of mountain	Oct., 1908–
12	Bairs	4,100	10.2	Edge of valley floor	Oct., 1908–Oct., 1910
13	...do	4,500	9.0	On outwash slope	Oct., 1908–Oct., 1910
14	...do	5,000	7.7	....do	Oct., 1908–Oct., 1910
15	...do	5,500	6.6	....do	Oct., 1908–Oct., 1910
16	...do	6,100	5.7	At base of mountain	Oct., 1908–Oct., 1910.
19	.....	4,700	7.2	On outwash slope	Sept., 1909–
20	.....	4,420	5.2	....do	Sept., 1909–

TABLE 6.—*Precipitation, in inches, at Los Angeles aqueduct stations near Independence, Cal., 1908–9.*

[Figures in parentheses estimated by C. H. Lee.]

Gage No.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1	(0.84)	0.14	Tr.	0.16	3.51	3.00	0.23	0.22	0	0	0	(0.20)	8.30
2	(.85)	.06	(Tr.)	.15	4.52	3.22	.24	Tr.	0	0	0	(.05)	9.09
3	(.85)	.04	(Tr.)	.27	4.85	4.02	.28	.04	0	0	0	(.05)	10.40
4	(.90)	.05	(Tr.)	.26	6.32	3.77	.37	.02	0	0	0	(.05)	11.74
5	(.95)	.12	(0.10)	.28	8.93	5.23	.80	.02	0	0	0	(.10)	16.53
6	(1.00)	(.17)	(.15)	(.12)	(12.69)	7.49	1.42	.05	0	0	0	(.15)	23.24
7	(.85)	(.04)	Tr.	.19	3.44	2.52	.12	.02	0	0	0	.04	7.22
8	(.85)	(.05)	Tr.	.21	4.65	3.06	.36	0	0	0	0	.06	9.24
9	(.90)	(.06)	Tr.	.25	5.89	3.49	.71	0	0	0	0	.05	11.35
10	(.95)	(.10)	.08	.25	7.69	4.62	.71	0	0	0	0	.07	14.47
11	(1.00)	(.15)	.23	.31	11.49	6.61	1.08	.02	0	0	0	.15	21.04
12	(.85)	Tr.	(Tr.)	.22	1.53	1.53	.15	Tr.	0	0	0	Tr.	4.28
13	(.85)	Tr.	(Tr.)	.26	2.67	2.06	.15	0	0	0	0	.10	6.09
14	(.90)	Tr.	(Tr.)	.27	3.48	2.56	.29	0	0	0	0	.13	7.63
15	(.95)	.14	(.10)	.29	5.05	4.36	.63	Tr.	0	0	0	.15	11.67
16	(1.00)	.28	(.15)	.29	6.43	4.98	1.00	.07	0	0	0	.14	14.34

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TABLE 7.—*Precipitation, in inches, at Los Angeles aqueduct stations near Independence, Cal., 1909–10.*

[Figures in parentheses estimated by C. H. Lee.]

Gage No.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1A	0.00	0	0.05	3.14	1.03	0	0.00	0.50	0	0	(1.00)	0	5.72
2	.00	0	.13	3.24	1.39	0	.00	.64	0	0	(1.25)	0	6.65
3	.00	0	.24	3.29	2.15	0	.00	.43	0	0	(1.50)	0	7.61
4	.07	0	.50	3.39	2.64	0	.00	.34	0	0	(1.75)	0	8.69
5	.08	0	.90	3.75	2.50	0	.00	.28	0	0	(1.75)	0	9.26
6	.11	0	1.20	6.39	3.00	0	.00	.24	0	0	(2.00)	0	12.94
18	.03	0	.01	2.20	.14	0	.05	.12	0	0	.60	0	3.15
17	.07	0	.26	2.50	.16	0	.04	.19	0	0	1.03	0	4.25
7	.01	0	.17	2.99	.60	0	.00	.44	0	0	.21	0	4.45
8A	.10	0	.27	3.20	.88	0	.03	.35	0	0	.44	0	5.27
9	.12	0	.40	3.60	1.20	0	.02	.23	0	0	.85	0	6.42
10	.13	0	.59	(3.95)	1.58	0	.06	.14	0	0	1.22	0	7.67
11	.18	0	1.24	(4.85)	2.30	0	.18	.16	0	0	1.28	0	10.19
12	.02	0	.02	3.08	.40	0	.03	.00	0	0	.19	0	3.74
13	.10	0	.04	2.68	.55	0	.03	.05	0	0	.18	0	3.63
14	.11	0	.09	3.97	.82	0	.03	.10	0	0	.22	0	5.34
15	.27	0	.27	(3.66)	1.11	0	.06	.26	0	0	.31	0	5.94
16	.18	0	.41	(4.19)	1.39	0	.11	.40	0	0	.56	0	7.24
19	.05	0	.22	4.19	.82	0	.12	.36	0	0	.50	0	6.26
20	.06	0	.34	6.68	.18	0	.07	.34	0	0	1.87	0	9.54

TABLE 8.—*Precipitation, in inches, at Bishop, Cal.*

[Elevation, 4,450 feet.]

Season.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1894–95	(0.00)	(0.00)	(0.00)	(3.00)	2.60	0.38	0.47	0.18	0.03	0.12	0.12	0.01	(6.91)
1895–96	.01	.19	.21	.03	1.52	.0	.93	.17	.04	.05	.61	.36	4.12
1896–97	Tr.	Tr.	.04	.48	.32	1.67	1.75	.0	.12	Tr.	.01	.05	4.44
1897–98	.09	.39	Tr.	.49	.05	.13	Tr.	.21	.23	Tr.	Tr.	.0	1.59
1898–99	.41	.0	.21	.11	1.65	.0	Tr.	.64	.02	.0	.0	.05	3.09
1899–1900	.0	.14	.05	1.05	.49	.01	.54	.60	.34	.12	Tr.	.0	3.34
1900–1901	.39	.03	2.69	.17	4.89	1.01	Tr.	.50	1.29	Tr.	.0	.39	11.90
1901–1902	.0	.81	.61	.12	.07	.55	1.53	.61	.06	0.	Tr.	.12	4.48
1902–1903	.05	.28	.97	.03	.46	.20	.35	.14	Tr.	.20	.0	.0	2.68
1903–1904	Tr.	.21	.0	.0	Tr.	1.65	2.39	.04	.06	Tr.	.39	.67	5.41
1904–1905	1.67	.64	.0	.10	.46	1.18	2.13	.04	.40	.02	.0	.0	6.64
1905–1906	.41	.0	.50	.05	2.34	.14	3.69	.74	.46	.19	.01	.51	9.04
1906–1907	.0	.0	.30	2.15	1.80	.15	1.41	.0	.14	Tr.	.0	Tr.	5.95
1907–1908	.0	2.59	.0	.74	1.58	1.65	.18	Tr.	.0	Tr.	.08	.15	6.97
1908–1909	(1.20)	(0.05)	(.0)	.42	3.77	1.47	.20	.42	.0	Tr.	.0	.0	7.53
1909–1910	Tr.	.27	.....	.....	.....	.....	.....	.....	.....	.19	.....	(.0)	.....
15-year mean	.28	.36	.37	.60	1.47	.68	1.04	.29	.21	.05	.08	.19	5.61

TABLE 9.—*Precipitation, in inches, at Laws, Cal.*

[Elevation, 4,113 feet.]

Season.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1883–84	0.12	0.11	0.00	0.38	0.62	0.64	0.94	0.05	0.00	0.00	0.00	0.00	2.86
1884–85	.0	.0	.0	1.00	.0	.0	.67	.14	.0	.0	.0	.0	1.81
1885–86	.0	.02	0.35	.0	1.03	.0	.50	.38	.0	.0	.0	.0	2.28
1886–87	.0	.0	.0	.20	.65	1.58	.0	.35	0.55	0.35	.0	.0	3.68
1887–88	.15	.15	.05	1.10	1.37	.47	.05	.0	.0	.35	0.20	.0	3.89
1888–89	.0	.0	1.72	.40	.10	.50	1.46	.12	.30	.0	.0	.0	4.60
1889–90	.0	.03	.35	1.20	4.75	.30	.0	.0	.0	.0	.0	0.50	7.13
1890–91	.69	.0	.0	1.00	.0	3.70	.28	.0	2.90	.0	.0	.03	8.60
1891–92	.19	.0	.0	3.52	.10	.70	1.10	.0	.25	Tr.	.0	.0	5.86
1892–93	.0	.20	1.42	2.27	1.22	1.12	.15	.0	.0	.0	1.05	Tr.	7.43
1893–94	.19	.0	.10	.49	.30	.75	.09	.05	Tr.	.35	Tr.	.23	2.55
1894–95	Tr.	.0	.0	1.18	1.10	.50	.22	.29	.15	.11	.21	.07	3.83
1895–96	Tr.	.16	.15	Tr.	1.07	.0	.60	.05	.03	.0	.57	.06	2.69
1896–97	.05	Tr.	Tr.	.16	.....	.....	.....	.....	.....	.....	.....	.....	.....
13-year mean	.10	.05	.30	.98	.95	.79	.47	.13	.32	.09	.16	.07	4.40

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TABLE 10.—*Precipitation, in inches, at Keeler, Cal.*

[Elevation, 3,622 feet. Figures in parentheses estimated from Lone Pine record.]

Season.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1883–84	.....	.....	.....	.....	.....	.....	.....	0.20	1.60	0.80	0	0.20	.....
1884–85	0	0	0	0.70	0	0	0.12	.82	0	.08	0	.11	1.83
1885–86	0	0.25	0.65	.36	0.49	0.14	.60	.40	0	0	0.14	.08	3.11
1886–87	0	.01	.08	0	Tr.	.93	0	1.14	.04	Tr.	.52	0	2.72
1887–88	1.08	.84	.01	.48	.70	1.21	.30	.12	.30	.20	.17	.10	5.51
1888–89	.06	0	1.68	.82	.04	Tr.	.52	.12	.06	.01	0	Tr.	3.31
1889–90	.08	.56	.05	.56	.42	.01	Tr.	.10	.20	0	Tr.	1.71	3.69
1890–91	.93	.03	.12	.22	0	1.00	2.01	0	.37	.30	.06	.02	5.06
1891–92	.19	.04	0	.31	.26	.19	.32	0	.56	Tr.	0	0	1.87
1892–93	Tr.	.81	.11	.54	.71	.75	1.50	0	Tr.	0	1.41	Tr.	5.83
1893–94	Tr.	Tr.	.03	1.48	Tr.	.29	.01	Tr.	Tr.	Tr.	.11	0	1.92
1894–95	0	0	0	1.05	.35	1.15	Tr.	.25	Tr.	Tr.	Tr.	Tr.	2.80
1895–96	Tr.	0	0	Tr.	.45	0	Tr.	Tr.	.15	Tr.	.25	1.42	2.27
1896–97	.50	Tr.	0	.25	.10	.27	.13	0	Tr.	0	0	.19	1.44
1897–98	.14	.15	Tr.	Tr.	0	0	0	.05	0	0	0	0	.34
1898–99	Tr.	0	Tr.	.30	.40	.45	0	.01	Tr.	.50	Tr.	Tr.	1.66
1899–1900	0	Tr.	1.75	Tr.	Tr.	0	.16	1.25	.23	Tr.	.10	Tr.	3.49
1900–1901	.35	.09	.45	0	.75	.25	0	Tr.	.40	0	0	.90	3.19
1901–2	0	.50	0	0	Tr.	.25	1.25	0	0	0	Tr.	Tr.	2.00
1902–3	Tr.	0	.50	.10	0	.10	Tr.	Tr.	Tr.	Tr.	0	0	.70
1903–4	0	0	0	0	Tr.	.70	.50	0	0	0	Tr.	1.00	2.20
1904–5	.55	.75	0	0	.90	1.00	3.30	Tr.	1.10	0	0	0	7.60
1905–6	0	0	.50	0	1.05	.20	(.90)	.85	0	0	.....	0	(3.50)
1906–7	.....	0	.30	.10	1.55	.33	1.12	0	0	1.00	0	0	4.40
1907–8	0	1.94	0	0	.91	1.08	0	0	.25	0	.50	.58	5.26
1908–9	2.75	0	0	0	.....	.....	.....	.....	.....	.....	.....	.....	.....
24-year mean.	.14	.25	.26	.30	.38	.43	.53	.21	.15	.09	.14	.26	3.15

TABLE 11.—*Precipitation, in inches, at Lone Pine, Cal.*

[Elevation, 3,728 feet. Figures in parentheses estimated from Independence record.]

Season.	Sept.	Oct.	Nov	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1904–5	.....	.....	(0)	(0)	0.60	0.86	3.51	0.16	1.19	0	0	0	.....
1905–6	0.15	0	0.63	0	1.00	.11	1.11	.23	.18	Tr.	Tr.	0.01	3.42
1906–7	0	0	.20	0.62	2.21	.31	1.42	.28	Tr.	0.04	Tr.	Tr.	5.08
1907–8	Tr.	2.71	Tr.	.26	1.57	2.18	.10	0	0	0	Tr.	.29	7.11
1908–9	1.12	.18	0	.10	.89	2.22	.23	Tr.	0	Tr.	0	.23	4.97
1909–10	.36	Tr.	Tr.	2.92	Tr.	0	.63	.20	0	.07	.18	0	4.36
5-year mean.	.33	.58	.17	.78	1.13	.96	.70	.14	.04	.02	.04	.11	4.99

TABLE 12.—*Observed precipitation, in inches, at base stations selected for Tuolumne River drainage area.*

Season (Sept. 1 to Aug. 31).	Modesto (elevation, 90 feet).	La Grange (elevation, 293 feet).	Sonora (elevation, 1,825 feet).	Second Garotte (elevation, 2,714 feet).	Crockers (elevation, 4,452 feet).
1868–69	.....	18.16	.....	.....	.....
1869–70	.....	12.84	.....	.....	.....
1870–71	.....	10.46	.....	.....	.....
1871–72	12.71	20.48	.....	.....	.....
1872–73	7.65	14.35	.....	.....	.....
1873–74	11.36	14.63	.....	.....	.....
1874–75	7.40	10.29	.....	.....	.....
1875–76	13.52	25.87	.....	.....	.....
1876–77	4.12	5.74	.....	.....	.....
1877–78	11.51	18.90	.....	.....	.....
1878–79	8.48	11.54	.....	.....	.....
1879–80	12.88	19.50	.....	.....	.....
1880–81	8.40	15.12	.....	.....	.....
1881–82	6.64	14.51	.....	.....	.....
1882–83	10.03	15.98	.....	(29.00)	.....
1883–84	12.87	25.01	.....	52.61	.....
1884–85	6.40	11.89	.....	29.50	.....
1885–86	12.79	24.09	.....	46.50	.....
1886–87	5.72	11.01	.....	27.00	.....
1887–88	6.58	11.43	21.75	25.00	.....
1888–89	7.61	14.43	25.66	27.25	.....
1889–90	16.40	30.34	67.39	67.25	.....
1890–91	7.49	.....	32.29	36.02	.....
1891–92	10.35	.....	30.40	32.25	.....
1892–93	14.17	19.37	43.76	47.25	.....

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TABLE 12.—*Observed precipitation, in inches, at base stations selected for Tuolumne River drainage area*—Continued.

Season (Sept. 1 to Aug. 31).	Modesto (elevation, 90 feet).	La Grange (elevation, 293 feet).	Sonora (elevation, 1,825 feet).	Second Garotte (elevation, 2,714 feet).	Crockers (elevation, 4,452 feet).
1893–94	11.40	22.77	37.53	37.25	.....
1894–95	16.40	22.36	45.95	52.00	.....
1895–96	10.60	14.71	31.17	32.05	.....
1896–97	11.63	19.80	38.23	37.79	63.44
1897–98	3.87	10.57	21.04	20.25	31.37
1898–99	9.35	12.83	32.81	29.29	42.43
1899–1900	11.91	.....	33.14	35.22	48.40
1900–1901	14.62	.....	46.79	55.75	75.04
1901–2	10.10	.....	28.42	(30.50)	48.63
1902–3	12.23	.....	33.03	.....	55.35
1903–4	8.85	.....	34.47	.....	55.19
1904–5	15.64	.....	32.83	.....	48.73
1905–6	12.55	.....	(51.16)	.....	83.54
1906–7	19.04	.....	(49.77)	.....	66.51
1907–8	9.79	.....	.....	.....	31.79
1908–9	11.16	.....	35.98	.....	61.20
1909–10	10.93	15.26	29.86	.....	55.54
Number of seasons observed	39	30	22	20	14
Mean of seasons observed	10.64	16.47	36.52	37.48	54.80
Computed long-term mean (1871–1910)	10.64	10.64	33.48	33.48	51.40

TABLE 13.—*Observed precipitation, in inches, at base stations selected for Merced River drainage area.*

Season (Sept. 1 to Aug. 31).	Merced (elevation, 173 feet).	Crockers (elevation, 4,452 feet).	Summerdale (elevation, 5,270 feet).	Yosemite (elevation, 4,063 feet).
1872–73	12.21	.....	.....	.....
1873–74	6.94	.....	.....	.....
1874–75	10.00	.....	.....	.....
1875–76	12.85	.....	.....	.....
1876–77	3.03	.....	.....	.....
1877–78	11.81	.....	.....	.....
1878–79	5.83	.....	.....	.....
1879–80	11.89	.....	.....	.....
1880–81	11.59	.....	.....	.....
1881–82	8.58	.....	.....	.....
1882–83	9.81	.....	.....	.....
1883–84	22.08	.....	.....	.....
1884–85	7.18	.....	.....	.....
1885–86	13.43	.....	.....	.....
1886–87	6.20	.....	.....	.....
1887–88	7.08	.....	.....	.....
1888–89	7.80	.....	.....	.....
1889–90	17.81	.....	.....	.....
1890–91	8.92	.....	.....	.....
1891–92	9.64	.....	.....	.....
1892–93	10.98	.....	.....	.....
1893–94	10.86	.....	.....	.....
1894–95	12.63	.....	.....	.....
1895–96	12.55	.....	.....	.....
1896–97	11.36	63.44	53.50	53.38
1897–98	5.76	31.37	29.39	.....
1898–99	7.82	42.43	39.77	.....
1899–1900	11.25	48.40	49.56	.....
1900–1901	11.42	75.04	85.47	.....
1901–2	9.98	48.63	45.83	.....
1902–3	11.89	55.35	49.83	.....
1903–4	8.36	55.19	49.78	[a] 41.87
1904–5	13.20	48.73	49.84	36.00
1905–6	17.76	83.54	84.84	.....
1906–7	16.38	66.51	71.77	55.64
1907–8	8.41	31.79	42.22	21.26
1908–9	14.38	61.20	66.55	49.48
1909–10	10.19	55.54	50.22	40.42
Number of seasons observed	38	14	14	7
Mean of seasons observed	10.79	54.80	54.90	42.58
Computed long-term mean (1872–1910)	10.79	51.40	52.40	39.77

[a] Computed value for December, 1903, is 1.97 inches.

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TABLE 14.—*Observed precipitation, in inches, at base stations selected for Kings River drainage area.*

Season (Sept. 1 to Aug. 31).	Merced [a] (elevation, 173 feet).	Fresno (elevation, 293 feet).	Sanger (elevation, 371 feet).	Selma (elevation, 311 feet).	Visalia [a] (elevation, 334 feet).	Summerdale [a] (elevation, 5,270 feet)
1872-73	12.21					
1873-74	6.94					
1874-75	10.00					
1875-76	12.85					
1876-77	3.03					
1877-78	11.81					
1878-79	5.83					
1879-80	11.89					
1880-81	11.59					
1881-82	8.58	6.60				
1882-83	9.81	9.84				
1883-84	22.08	18.71				
1884-85	7.18	7.20				
1885-86	13.43	19.45				
1886-87	6.20	8.47		7.79		
1887-88	7.08	6.73		5.71		
1888-89	7.80	7.99		7.35	10.68	
1889-90	17.81	13.01	17.24	14.43	14.22	
1890-91	8.92	8.25	6.23	6.96	9.15	
1891-92	9.64	9.93	9.68	7.48	12.31	
1892-93	10.98	11.10	8.91	8.65	10.27	
1893-94	10.86	8.59	9.69	5.91	7.80	
1894-95	12.63	14.67	15.58	10.95	13.41	
1895-96	12.55	8.42	9.43	6.72	7.89	
1896-97	11.36	10.32	12.18	8.73	10.79	53.50
1897-98	5.76	4.96	6.66	3.96	5.53	29.39
1898-99	7.82	7.84	9.29	6.91	9.07	39.77
1899-1900	11.25	10.28	11.28	9.34	9.83	49.56
1900-1901	11.42	11.33	14.77	9.16	12.88	85.47
1901-2	9.98	6.15	6.49	6.48	8.83	45.83
1902-3	11.89	8.50	7.19	7.82	7.56	47.83
1903-4	8.36	8.04	8.88	7.57	6.74	49.78
1904-5	13.20	12.09	13.76	12.83	11.49	49.84
1905-6	17.76	13.52	17.79	15.23	13.85	84.84
1906-7	16.38	10.84	15.93	12.26	11.85	71.77
1907-8	8.41	7.65	7.36	8.27	[b] 9.01	42.22
1908-9	14.38	9.88	10.23	12.13	[c] 13.28	66.55
1909-10	10.19	10.99	5.83	9.83	8.87	50.22
Number of seasons observed	38	29	21	24	22	14
Mean of seasons observed	10.79	10.05	10.69	8.85	10.24	54.90
Computed long-term mean (1872-1910)	10.79	9.70	10.03	8.72	9.73	52.40

[a] Merced and Summerdale are in the Merced River area and Visalia in the Kaweah River area, but the stations are used on account of scarcity of rainfall stations within the Kings River area.
[b] Computed value, October, 1907, 0.86 inch; December, 1907, 0.83 inch.
[c] Computed value March, 1909, 1.33 inches.

TABLE 15.—*Observed precipitation, in inches, at base stations selected for Kaweah River drainage area.*

Season (Sept. 1 to Aug. 31).	Fresno (elevation, 293 feet).	Visalia (elevation, 334 feet).	Tulare (elevation, 274 feet).	Lemon Cove (elevation, 600 feet).	Milo (elevation, 1,600 feet).
1881-82	6.60				
1882-83	9.48				
1883-84	18.71				
1884-85	7.20				
1885-86	19.45				
1886-87	8.47				
1887-88	6.73				
1888-89	7.99	10.68			
1889-90	13.01	14.22			
1890-91	8.25	9.15			
1891-92	9.93	12.31			
1892-93	11.10	10.27			
1893-94	8.59	7.80	5.99		
1894-95	14.67	13.41	10.47		
1895-96	8.42	7.89	5.85		

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TABLE 15.—*Observed precipitation, in inches, at base stations selected for Kaweah River drainage area*—Continued.

Season (Sept. 1 to Aug. 31).	Fresno (elevation, 293 feet).	Visalia (elevation, 334 feet).	Tulare (elevation, 274 feet).	Lemon Cove (elevation, 600 feet).	Milo (elevation, 1,600 feet).
1896–97	10.32	10.79	7.99	.....	.....
1897–98	4.96	5.53	5.13	.....	.....
1898–99	7.84	9.07	8.09	.....	.....
1899–1900	10.28	9.83	9.65	.....	.....
1900–1901	11.33	12.88	10.92	.....	.....
1901–2	6.15	8.83	6.92	.....	18.08
1902–3	8.50	7.56	6.63	12.89	19.76
1903–4	8.04	6.74	6.70	11.09	14.49
1904–5	12.09	11.49	13.14	19.71	22.39
1905–6	13.52	13.85	13.97	27.20	42.11
1906–7	10.84	11.85	11.73	20.58	[a] 27.19
1907–8	7.65	[b] 9.01	10.80	13.34	19.11
1908–9	9.88	[c] 13.28	12.17	13.97	33.43
1909–10	10.99	8.87	8.34	13.22	23.79
Number of seasons observed	29	22	17	8	9
Mean of seasons observed	10.05	10.24	9.09	16.50	24.48
Computed long-term mean (1872–1910)	9.70	9.73	9.13	15.72	24.40

[a] Computed value, November, 1906, 0.59 inch.
[b] Computed value, October, 1907, 0.86 inch; December, 1907, 0.83 inch.
[c] Computed value, March, 1909, 1.33 inches.

TABLE 16.—*Observed precipitation, in inches, at base stations selected for Tule River drainage area.*

Season (Sept. 1 to Aug. 31).	Porterville (elevation, 461 feet).	Tulare (elevation, 274 feet).	Milo (elevation, 1,600 feet).	Hot Springs (elevation, 3,300 feet).
1889–90	12.78	.....	.....	.....
1890–91	8.11	.....	.....	.....
1891–92	8.58	.....	.....	.....
1892–93	9.77	.....	.....	.....
1893–94	5.56	5.99	.....	.....
1894–95	10.97	10.47	.....	.....
1895–96	6.37	5.85	.....	.....
1896–97	9.66	7.99	.....	.....
1897–98	6.11	5.13	.....	.....
1898–99	7.96	8.09	.....	.....
1899–1900	9.24	9.65	.....	.....
1900–1901	12.76	10.92	.....	.....
1901–2	9.33	6.92	18.08	.....
1902–3	8.24	6.63	19.76	.....
1903–4	7.47	6.70	14.49	.....
1904–5	11.86	13.14	22.37	.....
1905–6	17.90	13.97	42.11	.....
1906–7	13.44	11.73	[a] 27.19	.....
1907–8	11.70	10.80	19.11	20.49
1908–9	14.95	12.17	33.43	38.59
1909–10	10.00	8.34	23.79	20.05
Number of seasons observed	21	17	9	3
Mean of seasons observed	10.13	9.09	24.48	26.38
Computed long-term mean (1881–1910)	10.36	9.46	21.76	22.37

[a] Computed value November, 1906, 0.59 inch.

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TABLE 17.—*Observed precipitation, in inches, at base stations selected for Kern River drainage area.*

Season (Sept. 1 to Aug. 31).	Bakersfield (elevation, 404 feet).	Porterville (elevation, 461 feet).	Kernville (elevation, 2,600 feet).	Isabella (elevation, 2,600 feet).
1889-90	5.70	12.78	.....	.....
1890-91	3.97	8.11	.....	.....
1891-92	5.51	8.58	.....	.....
1892-93	5.42	9.77	.....	.....
1893-94	2.77	5.56	.....	.....
1894-95	6.44	10.97	14.73	.....
1895-96	5.90	6.37	10.27	.....
1896-97	6.00	9.66	12.41	.....
1897-98	3.20	6.11	15.60	4.10
1898-99	2.80	7.96	5.38	5.38
1899-1900	5.23	9.24	5.69	6.62
1900-1901	(6.17)	12.76	13.03	13.72
1901-2	4.51	9.33	10.47	10.50
1902-3	4.98	8.24	7.56	6.73
1903-4	4.46	7.47	5.98	7.42
1904-5	8.27	11.86	11.29	12.54
1905-6	8.72	17.90	16.36	16.14
1906-7	4.85	13.44	8.77	10.91
1907-8	3.31	11.70	8.37	8.33
1908-9	7.39	14.95	21.17	23.70
1909-10	6.19	10.00	9.85	10.57
Number of seasons observed	21	21	16	13
Mean of seasons observed	5.32	9.09	11.06	10.51
Computed long-term mean (1881-1910)	5.44	10.36	10.88	10.61

TABLE 18.—*Variation in seasonal precipitation at Owens Valley stations.*

Season.	Percentage of 26-year mean at various stations.					Average.[b]
	Bishop.	Laws.[a]	Independence.	Lone Pine.	Keeler.	
1866-67	.....	.....	217	.....	.....	217
1867-68	.....	.....	370	.....	.....	370
1868-69	.....	.....	63	.....	.....	63
1869-70	.....	.....	50	.....	.....	50
1870-71	.....	.....	70	.....	.....	70
1871-72	.....	.....	134	.....	.....	134
1872-73	.....	.....	31	.....	.....	31
1873-74	.....	.....	134	.....	.....	134
1874-75	.....	.....	63	.....	.....	63
1875-76	.....	.....	100	.....	.....	100
1876-77	.....	.....	47	.....	.....	47
1883-84	.....	65	.....	.....	.....	65
1884-85	.....	41	.....	.....	58	41
1885-86	.....	52	.....	.....	99	52
1886-87	.....	84	.....	.....	86	84
1887-88	.....	88	.....	.....	175	88
1888-89	.....	104	.....	.....	105	104
1889-90	.....	162	.....	.....	117	162
1890-91	.....	195	.....	.....	161	195
1891-92	.....	133	.....	.....	59	133
1892-93	.....	169	159	.....	185	164
1893-94	.....	58	44	.....	61	51
1894-95	96	87	85	.....	89	89
1895-96	57	61	.....	.....	72	59
1896-97	61	.....	.....	.....	46	61
1897-98	22	.....	.....	.....	11	22
1898-99	43	.....	29	.....	53	36
1899-1900	46	.....	70	.....	111	58
1900-1901	165	.....	124	.....	101	145
1901-2	62	.....	80	.....	64	71
1902-3	37	.....	39	.....	22	38
1903-4	75	.....	51	.....	70	63
1904-5	92	.....	76	.....	241	84
1905-6	125	.....	129	77	111	110
1906-7	82	.....	79	115	140	92
1907-8	97	.....	114	161	167	124
1908-9	104	.....	145	112	.....	120
1909-10	.....	.....	97	99	.....	98

[a] 13-year observed mean. [b] Keeler not included.

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TABLE 19.—*Description and mean precipitation for stations in Central Pacific group.*[a]

Gage No.	Station.	Elevation.	Distance from Sacramento.	Length of record.	Observed mean seasonal precipitation.	Computed mean seasonal precipitation.			Observed precipitation, 1909–10.
						Base station.	Number of years covered.	Precipitation.	
		Feet.	*Miles.*	*Years.*	*Inches.*			*Inches.*	*Inches.*
1	Sacramento	71	0	61	19.50	Sacramento	40	19.36	12.18
2	Rocklin	249	18.9	8	28.45	Auburn	40	24.65	21.06
3	Newcastle	956	26.3	15	32.32	do	40	28.20	26.92
4	Auburn	1,363	30.0	40	34.93	do	40	34.93	36.12
5	Colfax	2,421	42.1	40	49.01	Colfax	40	49.01	49.69
6	Iowa Hill	2,825	46.8	31	52.64	do	40	50.53	50.68
7	Gold Run	3,222	48.8	11	54.49	Alta-Towle	40	43.05	48.34
8	Towle (Alta)	3,612	52.8	40	49.15	do	40	49.15	53.02
9	Blue Canyon	4,695	58.5	11	72.82	do	40	57.55	64.11
10	Emigrant Gap	5,230	61.7	30	53.50	Cisco	40	54.50	56.28
11	Cisco	5,939	67.9	40	51.96	do	40	51.96	58.85
12	Summit	7,017	78.6	39	48.00	do	40	47.60	37.00
13	Truckee	5,820	85.8	39	27.65	Truckee	39	27.65	25.01
14	Boca	5,531	92.0	38	20.47	Boca	38	20.47	25.93
15	Reno	4,484	110.1	39	7.05	Reno	39	7.05	7.52
16	Wadsworth (Fernley).	4,084	138.4	35	4.59	Wadsworth	35	4.59	5.17

[a] Stations 1 to 12 inclusive, seasonal totals (Sept. 1 to Aug. 31); stations 13 to 16 inclusive, calendar year totals, except last column.

TABLE 20.—*Description and mean precipitation for stations in Mokelumne group.*

Gage No.	Station.	Elevation.	Distance from Stockton.	Length of record.	Observed mean seasonal precipitation.	Computed mean seasonal precipitation.			Observed precipitation, 1909–10.
						Base station.	Number of years covered.	Precipitation.	
		Feet.	*Miles.*	*Years.*	*Inches.*			*Inches.*	*Inches.*
1	Stockton	23	0	60	15.31	Stockton	28	14.82	13.81
2	Farmington	111	13.0	33	16.47	Farmington	28	16.73	15.91
3	Ione	287	33.0	32	21.03	Ione	28	21.33	20.39
4	Valley Springs	673	31.2	22	24.71	Stockton	28	24.18	23.28
5	Jackson	1,200	40.0	20	33.19	Jackson	20	33.19	.....
6	Mokelumne Hill.	1,550	41.0	28	32.53	Mokelumne Hill.	28	32.53	32.93
7	West Point	2,800	52.8	16	42.50	do	28	41.15	39.56
8	Bear Valley Reservoir.	5,800	72.5	7	63.35	do	28	57.65	.....
9	Tamarack	8,012	89.5	11	57.23	do	28	54.73	48.94
10	Gardnerville	4,830	108.5	11	8.93	do	28	9.08	16.57
11	Wabuska	4,347	141.5	7	3.70	.....	.....	.....	3.49

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TABLE 21.—*Computed mean precipitation, in inches, at Los Angeles aqueduct stations, based on 26-year observed mean at Independence.*

Taboose group of gages.

Gage No.	Observed precipitation.		Computed mean seasonal precipitation based on—		
	Season 1908–9.	Season 1909–10.	Season 1908–9.	Season 1909–10.	Average.
2	9.09	6.65	6.27	6.86	6.56
3	10.40	7.61	7.17	7.85	7.51
4	11.74	8.69	8.10	8.96	8.53
5	15.53	9.26	11.40	9.55	10.48
6	23.24	12.94	16.03	13.34	14.69

Oak group of gages.

18	.....	3.15	.....	3.25	3.25
17	.....	4.25	.....	4.38	4.38
7	7.22	4.45	4.98	4.59	4.78
8	9.24	.....	6.37	.....	6.37
8A	.....	5.27	.....	5.43	5.43
9	11.35	6.42	7.83	6.62	7.22
10	14.47	7.67	9.98	7.91	8.94
11	21.04	10.19	14.51	10.51	12.51

Bairs group of gages.

12	4.28	3.74	2.95	3.86	3.40
13	6.09	3.63	4.20	3.74	3.97
14	7.63	5.34	5.26	5.51	5.38
15	11.67	5.94	8.05	6.12	7.08
16	14.34	7.24	9.89	7.46	8.68

Miscellaneous gages.

1	8.30	.....	5.72	.....	5.72
1A	.....	5.72	.....	5.90	5.90
19	.....	6.26	.....	6.45	6.45
20	.....	9.54	.....	9.84	9.84

TABLE 22.—*Relative flow of water through a porous medium at various temperatures, assuming the rate of flow at 32° F. as unity.*[a]

[By L. G. Carpenter, Fort Collins, Colo.]

Temperature.	Velocity.	Temperature.	Velocity.
°F.		°F.	
32	1.000	72	1.860
42	1.195	82	2.109
52	1.403	92	2.372
62	1.624	102	2.649

[a] Eng. News, June 30, 1898, p. 422.

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TABLE 23.—*Creek channels studied for percolation losses.*

Stream.	Points of measurement.				Length of channel.	Average slope.	Description of channel.
	Upper station.		Lower station.				
	Location.	Elevation.	Location.	Elevation.			
		Feet.		*Feet.*	*Miles.*	*Feet per mile.*	
Tinemaha Creek	Mouth of canyon	6,470	Cabin at spring west of Jeru Ranch.	4,665	3.60	502	Coarse alluvial deposit; luxuriant tree growth.
Do	Cabin at spring	4,665	U. S. Geol. Survey station	(4,150)	2.50	(206)	Coarse alluvial deposit; vegetation scattered.
Red Mountain Creek	Mouth of canyon	6,565	Point of departure from Tinemaha Creek.	4,875	3.40	497	Coarse alluvial deposit; luxuriant tree growth.
Taboose Creek	do	5,730	U. S. Geol. Survey station	3,970	4.80	367	Fissured lava; luxuriant tree growth.
Goodale Creek	do	5,900	do	3,980	4.20	457	Do.
Division Creek	do	6,000	Los Angeles aqueduct power house No. 2.	4,420	2.30	687	Fissured lava covered with wash; luxuriant tree growth.
Sawmill Creek	do	4,900	U. S. Geol. Survey station above road.	4,450	0.50	900	Coarse alluvial deposit; luxuriant tree growth.
Do	do	4,900	U. S. Geol. Survey station at road.	3,900	2.00	500	Do.
Oak Creek, North Fork	do	5,600	Junction with South Fork	4,350	2.60	480	Do.
Oak Creek, South Fork	do	5,800	Junction with North Fork	4,350	3.00	483	Coarse alluvial deposit; vegetation scattered.
Oak Creek, main channel	Junction of forks	4,350	U. S. Geol. Survey station	4,200	0.50	300	Coarse alluvial deposit; luxuriant tree growth.
Little Pine Creek	Mouth of canyon	5,900	Junction of Pinyon ditch	5,300	1.20	500	Do.
Do	Junction Pinyon ditch	5,300	Second pine tree	4,700	1.40	430	Coarse alluvial deposit; medium tree growth.
Do	Second pine tree	4,700	U. S. Geol. Survey station	4,150	1.80	305	Do.
Pinyon ditch	Mouth of canyon	6,200	Junction Little Pine Creek	5,350	1.75	486	Coarse alluvial deposit; no vegetation.
Do	Heading of Pinyon ditch	5,700	Heading of Davis ditch	4,200	4.25	353	Do.
Do	Heading of Davis ditch	4,200	Citrus road	3,900	1.00	300	Fine alluvial deposit; no vegetation.
Lime Fork of Little Pine Creek.	Mouth of canyon	6,500	Junction of Little Pine Creek.	5,800	0.75	935	Do.
Symmes Creek	do	6,300	U. S. Geol. Survey station	4,500	4.50	400	Coarse alluvial deposit; no vegetation.
Symmes Creek, North Fork	do	6,800	Junction of Symmes Creek	5,000	.....	.....	Do.
Shepard Creek	do	6,400	Point of branching	4,430	4.75	415	Do.
Shepard Creek, North Branch.	Point of branching	4,430	U. S. Geol. Survey station	4,000	1.50	286	Do.
Shepard Creek South Branch.	do	4,430	do	4,050	1.25	304	Do.
Bairs Creek, North Fork	Mouth of canyon	6,100	Junction with South Fork	4,800	2.60	500	Coarse alluvial deposit; luxuriant tree growth.
Bairs Creek, South Fork	do	6,300	Junction with North Fork	4,800	3.00	500	Do.
Bairs Creek, main channel	Junction of forks	4,800	U. S. Geol. Survey station	4,200	1.90	316	Coarse alluvial deposit; occasional trees.
George Creek	Mouth of canyon	6,450	do	4,200	5.50	409	Coarse alluvial deposit; luxuriant tree growth.

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TABLE 24.—*Discharge measurements on which studies of stream percolation are based.*

Stream and gaging stations.	Date of measurement.	Discharge at— Upper station. Time.	Upper station. Temperature of water (°F.).	Upper station. Discharge (second-feet).	Lower station. Time.	Lower station. Temperature of water (°F.).	Lower station. Discharge (second-feet).	Loss. Total (second-feet).	Loss. Second-feet per mile.	Remarks.
Tinemaha Creek, mouth of canyon to old cabin.	Apr. 8, 1909	10.30 a. m.	40	2.73	4.00 p. m.	58	1.43	1.30	0.36	
	May 13, 1909	10.15 a. m.	43	8.45	2.00 p. m.	52	7.73	.72	.20	Loss appears too small.
	Aug. 4, 1909	9.50 a. m.	47	26.10	2.00 p. m.	57	21.50	4.60	1.28	
Tinemaha Creek, old cabin to U. S. Geol. Survey station.	Apr. 8, 1909	4.00 p. m.	58	1.43	5.10 p. m.	60	3.51	− 2.08	.....	Gain is from springs and irrigation seepage.
	May 13, 1909	2.00 p. m.	52	7.73	3.00 p. m.	57	11.40	− 3.67	.....	Do.
	Aug. 4, 1909	2.00 p. m.	57	21.50	3.10 p. m.	64	24.50	− 3.00	.....	Do.
Red Mountain Creek, mouth of canyon to departure from Tinemaha Creek.	Apr. 8, 1909	12.50 p. m.	42.5	2.58	3.15 p. m.	59	1.33	1.25	.37	
	May 13, 1909	11.15 a. m.	43	11.24	1.15 p. m.	52	7.35	3.89	1.14	
	Aug. 4, 1909	11.15 a. m.	49	12.90	1.00 p. m.	59	7.40	5.50	1.62	
Taboose Creek, mouth of canyon to U. S. Geol. Survey station.	June 29, 1908	12.00 m.	.....	12.80	5.00 p. m.	.....	6.40	6.40	1.33	
	Sept. 27, 1908	1.00 p. m.	.....	9.00	6.00 p. m.	.....	4.90	4.10	.86	
	Nov. 14, 1908	10.15 a. m.	41	7.26	3.10 p. m.	48	3.36	3.90	.81	
	Apr. 6, 1909	10.45 a. m.	44	7.31	3.25 p. m.	55	2.81	4.50	.94	
	May 14, 1909	10.15 a. m.	45	14.21	2.30 p. m.	54	6.55	7.66	1.60	
	Aug. 5, 1909	10.50 a. m.	50	22.90	2.45 p. m.	61	11.70	11.20	2.34	
Goodale Creek, mouth of canyon to U. S. Geol. Survey station.	June 26, 1908	3.30 p. m.	.....	10.80	2.00 p. m.	.....	4.80	6.00	1.25	Upper station one-half mile above regular at 6,400-foot level.
	June 29, 1908	3.00 p. m.	.....	10.70	5.45 p. m.	.....	6.40	4.30	1.02	
	Sept. 27, 1908	4.00 p. m.	.....	8.37	6.30 p. m.	.....	4.10	4.27	1.00	
	Nov. 14, 1908	12.00 m.	42.5	5.13	3.30 p. m.	45	2.61	2.52	.60	
	Apr. 6, 1909	12.45 p. m.	44	5.75	4.15 p. m.	50	2.97	2.78	.66	
	May 14, 1909	12.15 p. m.	46	11.90	3.20 p. m.	54	6.45	5.45	1.30	
	Aug. 5, 1909	12.45 p. m.	52	15.60	3.45 p. m.	61	7.80	7.80	1.86	
Division Creek, mouth of canyon to Los Angeles aqueduct power house No. 2.	June 27, 1908	10.30 a. m.	.....	9.13	11.45 a. m.	.....	6.44	2.69	1.17	Upper station, discharge includes 2 springs 2.5 second-feet.
	Sept. 27, 1908	10.30 a. m.	.....	8.76	11.45 a. m.	.....	7.92	.84	.36	Do.
	Nov. 13, 1908	2.00 p. m.	42	8.55	4.00 p. m.	45	7.29	1.26	.55	Do.
	Feb. 24, 1909	12.00 m.	41	8.17	12.00 m.	44	7.69	.48	.21	No change in gage height 2 p. m.; includes springs.
Sawmill Creek, mouth of canyon to U. S. Geol. Survey station above road.	June 26, 1908	10.30 a. m.	.....	4.22	11.00 a. m.	.....	3.80	.42	.84	
	Nov. 13, 1908	10.15 a. m.	43	4.86	11.15 a. m.	43	4.95	− .11	.00	

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Oak Creek, North Fork, mouth of canyon to junction of South Fork.	Sept. 28, 1908	1.00 p. m.	.....	10.20	3.00 p. m.	.....	8.90	1.30	.50	
	Oct. 8, 1908	1.25 p. m.	.....	8.32	12.00 m.	.....	7.52	.80	.31	
	Nov. 15, 1908	10.15 a. m.	40	7.10	12.00 m.	43	7.39	− .29	.....	Stream from Charlies Canyon not included.
	Apr. 9, 1909	1.30 p. m.	46	8.39	3.45 p. m.	51	8.89	− .50	.....	Do.
	May 12, 1909	10.00 a. m.	42	18.60	1.15 p. m.	46	22.20	− 3.60	.....	Do.
	June 10, 1909	11.30 a. m.	.....	36.30	3.00 p. m.	.....	38.40	− 2.10	.....	Charlies Canyon and McGann ditch measured.
	July 30, 1909	9.45 a. m.	48	27.70	11.30 a. m.	55	21.00	6.70	2.58	Measurement same as June 10; upper section very poor.
Oak Creek, South Fork, mouth of canyon to junction of North Fork.	Sept. 13, 1909	8.45 a. m.	44	14.20	11.15 a. m.	52	10.40	3.80	1.46	
	Oct. 8, 1908	10.00 a. m.	.....	6.64	11.30 a. m.	.....	4.32	2.32	.77	
	Nov. 15, 1908	10.30 a. m.	.....	5.10	12.30 p. m.	45	3.52	1.58	.53	
	Apr. 9, 1909	9.45 a. m.	45	5.93	12.45 p. m.	59	3.68	2.25	.75	
	May 12, 1909	9.30 a. m.	44	15.20	2.00 p. m.	51	12.40	2.80	.93	
	July 30, 1909	10.00 a. m.	.....	30.90	11.45 a. m.	59	21.00	9.90	3.30	
	Sept. 8, 1909	11.30 a. m.	53	17.00	3.00 p. m.	63	10.40	6.60	2.20	
Oak Creek main channel, junction of forks to U. S. Geol. Survey station.	Oct. 8, 1908	12.00 m.	.....	11.84	3.15 p. m.	.....	11.14	.70	1.40	
	Nov. 15, 1908	12.00 m.	44	10.91	1.00 p. m.	45	10.59	.32	.64	
	Apr. 9, 1909	3.30 p. m.	56	12.13	4.15 p. m.	54	11.42	.71	1.42	
	May 12, 1909	1.30 p. m.	48	34.60	3.00 p. m.	48	31.80	2.80	5.60	
	June 10, 1909	3.00 p. m.	.....	58.50	4.00 p. m.	.....	49.00	9.50	19.00	
	July 30, 1909	11.30 a. m.	57	42.00	1.15 p. m.	59	38.90	3.10	6.20	
Oak Creek, combined channels, mouth of canyon to U. S. Geol. Survey station. For subsequent dates, see above.	Aug. 20, 1906	.....	.....	101.00	.....	.....	68.00	33.00	5.40	
	June 25, 1908	12.00 m.	.....	28.70	2.00 p. m.	.....	22.00	6.70	1.10	
	Sept. 28, 1908	1.00 p. m.	.....	14.00	3.30 p. m.	.....	13.10	.90	.15	Not plotted; measurement on South Fork questioned.
	June 24, 1908	12.00 m.	.....	31.40	1.30 p. m.	.....	25.90	5.50	1.72	Pinyon Creek measured at mouth of canyon.
Little Pine Creek, junction of Pinyon ditch to U. S. Geol. Survey station.	Sept. 12, 1908	11.00 a. m.	.....	15.20	3.00 p. m.	.....	13.40	1.80	.56	Subsequent measurements just below junction.
	Oct. 5, 1908	1.30 p. m.	.....	9.88	5.00 p. m.	.....	7.55	2.33	.73	
	Oct. 31, 1908	1.00 p. m.	44	7.96	3.30 p. m.	45	6.27	1.69	.53	
	Dec. 11, 1908	12.15 p. m.	.....	6.05	2.30 p. m.	.....	5.68	.37	.12	
	Jan. 18, 1909	10.45 a. m.	41	7.26	2.30 p. m.	46	6.49	.77	.24	
	Jan. 29, 1909	10.30 a. m.	33	6.91	2.00 p. m.	38	6.39	.52	.16	
	Mar. 13, 1909	10.00 a. m.	39	5.20	3.00 p. m.	50	5.10	.10	.00	
	Apr. 23, 1909	12.10 p. m.	52	11.90	2.30 p. m.	55	10.87	1.03	.32	
	May 11, 1909	10.30 a. m.	47	44.80	5.00 p. m.	48	36.30	8.50	2.66	
	June 4, 1909	2.00 p. m.	52	95.20	4.00 p. m.	55	90.40	4.80	1.50	Upper measurements poor; very high velocity.
	July 22, 1909	1.30 p. m.	57	56.70	5.00 p. m.	60	65.50	− 8.80	− 2.75	
	Aug. 9, 1909	9.00 a. m.	53	28.60	1.15 p. m.	63	31.60	− 3.00	− .94	
	Aug. 23, 1909	11.00 a. m.	57	27.50	2.30 p. m.	64	31.40	− 3.90	− 1.22	
	Sept. 11, 1909	8.00 a. m.	50	15.50	11.30 a. m.	57	16.40	− .80	− .25	
	Oct. 27, 1909	9.30 a. m.	43	7.20	1.30 p. m.	51	5.80	1.40	.44	
Little Pine Creek, mouth of canyon to junction of Pinyon ditch.	Oct. 5, 1908	10.30 a. m.	.....	8.11	1.30 p. m.	.....	8.19	.08	.00	Loss negligible.
	Oct. 31, 1908	10.00 a. m.	39	5.40	1.00 p. m.	44	5.76	− .36	.00	Do.
Little Pine Creek, junction of Pinyon ditch to second pine tree.	Oct. 5, 1908	1.30 p. m.	.....	9.88	3.30 p. m.	.....	7.82	2.06	1.47	
	Oct. 31, 1908	1.00 p. m.	44	7.96	2.30 p. m.	44	5.71	2.25	1.60	
	Dec. 11, 1908	12.15 p. m.	.....	6.05	1.30 p. m.	.....	5.12	.93	.66	

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TABLE 24.—*Discharge measurements on which studies of stream percolation are based*—Continued.

Stream and gaging stations.	Date of measurement.	Discharge at— Upper station. Time.	Upper station. Temperature of water (°F.).	Upper station. Discharge (second-feet).	Lower station. Time.	Lower station. Temperature of water (°F.).	Lower station. Discharge (second-feet).	Loss. Total (second-feet).	Loss. Second-feet per mile.	Remarks.
Little Pine Creek, second pine tree to U. S. Geol. Survey station.	Oct. 5, 1908	3.30 p. m.	.....	7.82	5.00 p. m.	.....	7.55	0.27	0.15	
	Oct. 31, 1908	2.30 p. m.	44	5.71	3.30 p. m.	45	6.27	− .56	.....	
	Dec. 11, 1908	1.30 p. m.	.....	5.12	2.30 p. m.	.....	5.68	− .56	.....	
	May 15, 1909	1.00 p. m.	49	11.23	3.00 p. m.	52.5	5.83	5.40	3.10	No waste down old channel.
	July 22, 1909	10.30 a. m.	52	16.30	2.00 p. m.	55	10.80	5.50	3.14	4.7 second-feet waste down old channel.
Pinyon ditch, mouth of canyon to junction of Little Pine Creek.	Aug. 9, 1909	10.30 a. m.	51	3.80	11.45 a. m.	60	2.60	1.20	.68	7.10 second-feet waste down old channel.
	Aug. 23, 1909	9.30 a. m.	51	3.29	10.45 a. m.	60	1.96	1.33	.76	4.87 second-feet waste down old channel.
	Sept. 10, 1909	10.30 a. m.	50	1.86	11.25 a. m.	62	1.19	.67	.38	4.16 second-feet waste down old channel.
Pinyon Creek, heading of Pinyon ditch to heading of Davis ditch.	June 15, 1909	10.15 a. m.	49	24.70	5.00 p. m.	62	11.80	12.90	3.04	Upper measurements poor; very high velocity.
	July 2, 1909	10.30 a. m.	.....	23.50	3.00 p. m.	.....	18.10	5.40	1.27	
Pinyon Creek, heading of Davis ditch to Citrus road crossing.	June 15, 1909	5.00 p. m.	62	11.20	5.30 p. m.	65	9.30	1.90	1.90	
Lime Fork of Little Pine Creek, mouth of canyon to junction of Little Pine Creek.	May 15, 1909	2.00 p. m.	53	2.30	2.30 p. m.	55	1.41	.89	1.19	
	June 4, 1909	1.00 p. m.	55	4.90	1.30 p. m.	63	2.60	2.31	3.06	
	July 2, 1909	12.30 p. m.	.....	.76	1.00 p. m.	.....	.25	.51	.68	
	July 22, 1909	9.30 a. m.	59	.29	10.00 a. m.	70	.10	.19	.25	
Symmes Creek, mouth of canyon to U. S. Geol. Survey station.	June 24, 1908	4.45 p. m.	.....	8.43	7.00 p. m.	.....	3.53	4.90	1.09	
	Sept. 22, 1908	12.30 p. m.	.....	2.08	.....	.....	.0	2.08	.....	Flow 1 mile above and still advancing at 2.30 p. m.
	Dec. 7, 1908	1.30 p. m.	35	1.78	5.30 p. m.	35	.0	1.78	.40	Flow just reached U. S. Geol. Survey station.
	Feb. 4, 1909	1.15 p. m.	36	1.89	.....	45	.0	1.89	.....	Flow 0.8 mile above and still advancing at 3.00 p. m.
	Mar. 13, 1909	12.30 p. m.	48	2.36	.....	.....	.0	2.36	.....	Do.
	Apr. 6, 1909	3.30 p. m.	51	3.77	5.00 p. m.	.....	.0	3.77	.84	Flow just reached U. S. Geol. Survey station.
	May 11, 1909	1.00 p. m.	48	22.50	3.30 p. m.	55	18.80	3.70	.82	North tributary discharging. Loss too small.
	June 15, 1909	1.00 p. m.	53	40.50	3.30 p. m.	62	30.50	10.00	2.22	North tributary discharging.
	July 20, 1909	11.45 a. m.	53	14.10	3.30 p. m.	69	8.50	5.60	1.24	North tributary dry.

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Symmes Creek, North Fork, mouth of canyon to junction of Symmes Creek	May 5, 1909	1.00 p. m.	49	4.39	3.15 p. m.	67	1.84	2.55	.57	
	June 4, 1909	12.00 m.	52	6.40	9.15 a. m.	.....	5.50	.90	.20	"Loss" in error; time not right.
Shepard Creek, mouth of canyon to point of branching.	Nov. 11, 1908	10.30 a. m.	36	7.23	1.40 p. m.	.....	5.04	2.19	.46	Ice melting; results in error.
	Apr. 2, 1909	9.45 a. m.	41	6.59	1.15 p. m.	57	5.89	.70	.14	
	May 11, 1909	1.20 p. m.	44	28.40	3.45 p. m.	48	26.80	1.00	.34	
Shepard Creek, North Branch, point of branching to U. S. Geol. Survey station.	Nov. 11, 1908	1.40 p. m.	.....	2.15	10.00 a. m.	.....	.56	1.59	1.06	Do.
	Apr. 2, 1909	1.30 p. m.	57.5	4.94	3.15 p. m.	65	2.18	2.76	1.84	
	May 11, 1909	4.30 p. m.	48	21.20	.....	.....	9.61	11.59	7.70	
Shepard Creek, South Branch, point of branching to U. S. Geol. Survey station.	Nov. 11, 1908	1.40 p. m.	.....	5.04	10.00 a. m.	.....	1.94	3.10	2.48	Ice melting; results in error.
	Apr. 2, 1909	1.30 p. m.	57.5	.95	2.30 p. m.	66	.49	.46	.37	
	May 11, 1909	4.30 p. m.	48	5.63	.....	.....	7.18	−1.55	.....	
	June 15, 1909	2.00 p. m.	60	11.90	3.00 p. m.	63	9.70	2.20	1.76	
	July 1, 1908	11.00 a. m.	.....	25.30	10.00 a. m.	.....	15.30	10.00	1.33	Lower measurements in four channels.
	Sept. 22, 1908	10.30 a. m.	.....	19.50	1.30 p. m.	.....	9.70	9.80	1.31	Lower measurements in two channels.
Shepard Creek, combined channel, mouth of canyon to U. S. Geol. Survey station.	Nov. 11, 1908	10.30 a. m.	36	7.23	10.00 a. m.	.....	2.50	4.73	.63	
	Feb. 4, 1909	10.45 a. m.	35	5.18	3.00 p. m.	44	3.35	1.83	.24	
	Apr. 2, 1909	9.45 a. m.	41	6.59	3.00 p. m.	66	2.67	3.92	.52	
	May 11, 1909	1.20 p. m.	44	28.40	.....	.....	15.50	12.90	1.72	
	June 15, 1909	10.15 a. m.	50	62.10	3.30 p. m.	64	49.70	12.40	1.65	
	July 29, 1909	10.30 a. m.	50	39.30	3.00 p. m.	65	24.60	14.70	1.96	
Bairs Creek, North Fork, mouth of canyon to junction with South Fork.	Sept. 21, 1908	2.30 p. m.	.....	2.41	4.00 p. m.	.....	1.92	.49	.19	
	Nov. 12, 1908	2.15 p. m.	37	1.70	3.50 p. m.	43	1.25	.45	.17	
	Feb. 2, 1909	2.20 p. m.	35	1.67	4.00 p. m.	41	.91	.76	.29	
	Apr. 3, 1909	1.45 p. m.	40	3.57	3.30 p. m.	52	1.53	2.04	.78	
	May 10, 1909	12.30 p. m.	47	10.49	2.15 p. m.	52	7.82	2.67	1.03	
	June 14, 1909	2.15 p. m.	49	23.20	4.30 p. m.	53	19.00	4.20	1.61	
	July 28, 1909	3.00 p. m.	52	7.20	4.15 p. m.	57	6.10	1.10	.42	
	Sept. 9, 1909	10.20 a. m.	51	4.94	11.45 a. m.	57	2.36	2.58	.99	
Bairs Creek, South Fork, mouth of canyon to junction with North Fork.	Sept. 21, 1908	1.15 p. m.	.....	1.42	3.45 p. m.	.....	.42	1.00	.33	
	Nov. 12, 1908	1.10 p. m.	38	.99	3.45 p. m.	48	.58	.41	.14	
	Feb. 2, 1909	1.05 p. m.	34	1.75	3.45 p. m.	43	.12	1.63	.54	
	Apr. 3, 1909	12.30 p. m.	45	2.28	3.10 p. m.	61	.95	1.33	.44	
	May 10, 1909	11.00 a. m.	43	10.39	2.30 p. m.	54	10.33	.0	.0	Possible error in measurement.
	June 14, 1909	1.00 p. m.	48	17.40	4.00 p. m.	54	15.90	1.50	.50	
	July 28, 1909	2.00 p. m.	53	4.80	4.00 p. m.	63	3.40	1.40	.47	
	Sept. 9, 1909	9.40 a. m.	53	1.54	11.30 a. m.	65	.53	1.01	.34	
Bairs Creek, main channel, junction of forks to U. S. Geol. Survey station.	Sept. 21, 1908	4.00 p. m.	.....	2.34	4.30 p. m.	.....	1.68	.66	.35	
	Nov. 12, 1908	3.45 p. m.	46	1.83	4.20 p. m.	.....	1.75	.08	.0	
	Feb. 2, 1909	4.00 p. m.	42	1.03	3.30 p. m.	43	.41	.62	.33	
	Apr. 3, 1909	3.20 p. m.	56	2.48	4.10 p. m.	59	2.17	.31	.16	
	May 10, 1909	2.30 p. m.	53	18.15	3.15 p. m.	56	14.08	4.07	2.14	
	June 14, 1909	4.15 p. m.	54	34.90	3.50 p. m.	57	30.40	4.50	2.37	
	July 28, 1909	4.00 p. m.	60	9.50	5.00 p. m.	62	8.10	1.40	.74	
	Sept. 9, 1909	11.30 a. m.	61	2.89	12.45 p. m.	67	3.22	−.33	.....	
Bairs Creek, combined channel, mouth of canyon to U. S. Geol. Survey station.	July 1, 1908	2.00 p. m.	.....	9.79	12.30 p. m.	.....	4.62	5.17	.69	

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TABLE 24.—*Discharge measurements on which studies of stream percolation are based*—Continued.

Stream and gaging stations.	Date of measurement.	Discharge at—						Loss.		Remarks.
		Upper station.			Lower station.			Total (second-feet).	Second-feet per mile.	
		Time.	Temperature of water (°F.).	Discharge (second-feet).	Time.	Temperature of water (°F.).	Discharge (second-feet).			
George Creek, mouth of canyon to U. S. Geol. Survey station.	Oct. 30, 1906	.....	.....	4.80	.....	.....	3.10	1.70	0.31	
	July 1, 1908	5.00 p. m.	.....	27.90	2.15 p. m.	.....	17.40	10.50	1.91	
	Sept. 12, 1908	11.20 a. m.	.....	9.10	2.30 p. m.	.....	6.70	2.40	.44	
	Nov. 12, 1908	11.00 a. m.	37	4.85	3.10 p. m.	.....	3.00	1.85	.34	
	Feb. 2, 1909	11.15 a. m.	37	4.34	3.00 p. m.	.....	2.03	2.31	.42	
	Apr. 3, 1909	10.15 a. m.	42	7.64	3.00 p. m.	65	5.01	2.63	.48	
	May 10, 1909	9.30 a. m.	42	32.30	2.30 p. m.	50	22.00	10.30	1.87	
	June 14, 1909	11.15 a. m.	46	61.00	2.45 p. m.	53	53.00	8.00	1.45	Upper measurements poor; very high velocity.
	July 28, 1909	11.30 a. m.	49	28.90	3.00 p. m.	57	18.70	10.20	1.86	
	Sept. 7, 1909	10.30 a. m.	49	16.30	1.30 p. m.	58	11.20	5.10	.93	

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TABLE 25.—*Seasonal discharge of Kings River at Red Mountain for 21 years.*

[Drainage area, 1,742 square miles.]

Season (Sept. 1 to Aug. 31).	Discharge in second-feet.						Run-off.		Variation from mean (per cent).
	Maximum.	Minimum.	Highest monthly mean.	Lowest monthly mean.	Mean.	Mean per square mile.	Depth in inches.	Acre-feet.	
1878–79	.....	.....	5,090	290	1,620	0.93	12.62	1,172,600	−39
1879–80	.....	.....	9,540	270	2,760	1.58	21.44	2,001,100	+ 4
1880–81	.....	.....	8,220	220	2,580	1.48	20.09	1,868,400	− 3
1881–82	.....	.....	9,190	230	2,050	1.18	16.01	1,487,400	−22
1882–83	.....	.....	6,730	320	1,770	1.02	13.84	1,283,900	−33
1883–84	.....	.....	17,600	220	4,590	2.63	35.69	3,330,100	+73
1895–96	22,100	250	12,700	328	2,580	1.48	20.09	1,870,700	− 3
1896–97	22,700	310	14,500	350	2,890	1.66	22.53	2,097,900	+ 9
1897–98	8,350	215	3,550	320	1,230	.70	9.50	888,100	−54
1898–99	20,200	145	6,080	204	1,700	.98	13.30	1,227,800	−36
1899–1900	12,700	180	5,880	215	1,760	1.01	13.71	1,280,200	−34
1900–1901	43,900	215	14,400	301	4,310	2.48	33.66	3,128,600	+63
1901–2	26,400	320	8,060	440	2,160	1.24	16.83	1,566,700	−18
1902–3	17,300	215	9,550	265	2,340	1.34	18.19	1,692,500	−12
1903–4	15,700	130	10,400	183	2,360	1.35	18.32	1,714,800	−11
1904–5	9,800	280	6,450	354	2,010	1.15	15.61	1,457,800	−24
1905–6	26,600	150	17,100	174	5,220	3.00	40.72	3,801,900	+98
1906–7	15,600	330	10,400	397	3,840	2.20	29.86	2,786,100	+45
1907–8	6,900	265	3,580	363	1,420	.82	11.13	1,034,200	−46
1908–9	32,800	265	14,100	312	3,860	2.21	29.99	2,789,400	+45
1909–10	41,800	280	7,810	401	2,485	1.43	19.41	1,803,800	− 6
Mean	21,523	237	9,568	293	2,645	1.52	20.60	1,918,300	.....

TABLE 26.—*Seasonal discharge of five Sierra Nevada rivers.*

Season (Sept. 1 to Aug. 31).	Tuolumne River.[a]			Merced River.[b]			Kaweah River.[c]		
	Discharge.		Per cent of 20-year mean.	Discharge.		Per cent of 20-year mean.	Discharge.		Per cent of 20-year mean.
	Second-feet.	Second-feet per square mile.		Second-feet.	Second-feet per square mile.		Second-feet.	Second-feet per square mile.	
1878–79	2.004	1.18	66	.....	.....	.....	299	0.43	36
1879–80	3.615	2.14	120	1,718	1.58	108	954	1.38	117
1880–81	2,915	1.73	97	1,800	1.65	112	555	.80	68
1881–82	2.233	1.32	74	1,132	1.04	71	578	.83	70
1882–83	2,050	1.21	68	1,381	1.27	86	384	.55	47
1883–84	3,313	1.96	110	2,488	2.28	155	1,513	2.18	185
1895–96	2.209	1.42	80	.....	.....	.....	.....	.....	.....
1896–97	3.439	2.21	124	.....	.....	.....	.....	.....	.....
1897–98	1,357	.87	49	.....	.....	.....	.....	.....	.....
1898–99	1,924	1.24	70	.....	.....	.....	.....	.....	.....
1899–1900	2,319	1.49	84	.....	.....	.....	.....	.....	.....
1900–1901	3,782	2.43	137	.....	.....	.....	.....	.....	.....
1901–2	2,229	1.43	80	1,154	1.06	72	.....	.....	.....
1902–3	2,726	1.75	98	1,342	1.23	84	.....	.....	.....
1903–4	3,631	2.33	131	1,507	1.38	94	503	.97	82
1904–5	2.424	1.56	88	1,267	1.16	79	478	.92	78
1905–6	4,821	3.10	174	2,791	2.56	174	1,482	2.85	242
1906–7	5,180	3.32	187	2,941	2.70	184	831	1.60	136
1907–8	1,511	.97	54	725	65	44	349	.67	57
1908–9	3,168	2.04	115	2,053	1.88	128	1,108	2.13	180
Observed mean	2,842	1.78	.....	1,715	1.57	.....	753	1.28	.....
Computed 20-year mean	2,842	1.78	.....	1,600	1.47	.....	700	1.18	.....

[a] Drainage area above gaging station—1,691 square miles, California Eng. Dept.; 1,557 square miles, U. S. Geol. Survey.

[b] Drainage area above gaging station—1,090 square miles.

[c] Drainage area above gaging station—604 square miles, California Eng. Dept.; 520 square miles, U. S. Geol. Survey.

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TABLE 26.—*Seasonal discharge of five Sierra Nevada rivers*—Continued.

Season (Sept. 1 to Aug. 31).	Tule River.[a]			Kern River.[b]		
	Discharge.		Per cent of 20-year mean.	Discharge.		Per cent of 20-year mean.
	Second-feet.	Second-feet per square mile.		Second-feet.	Second feet per square mile.	
1878–79	107	0.24	27	582	0.25	54
1879–80	558	1.28	145	1,073	.46	100
1880–81	339	.78	89	1,339	.57	124
1881–82	368	.84	95	660	.28	61
1882–83	308	.70	80	642	.27	59
1883–84	1,096	2.51	285	2,352	1.00	217
1893–94	.....	.....	.....	834	.36	78
1894–95	.....	.....	.....	1,399	.60	130
1895–96	.....	.....	.....	864	.37	80
1896–97	.....	.....	.....	1,221	.52	113
1897–98	.....	.....	.....	413	.18	39
1898–99	.....	.....	.....	458	.20	44
1899–1900	.....	.....	.....	435	.19	41
1900–1901	.....	.....	.....	1,188	.51	111
1901–2	156	.59	67	798	.34	74
1902–3	154	.58	66	770	.33	72
1903–4	96	.36	41	640	.27	59
1904–5	101	.38	43	761	.32	70
1905–6	458	1.72	195	2,464	1.05	228
1906–7	215	.81	92	(1,550)	(.66)	143
1907–8	114	.43	49	.....	.....	.....
1908–9	395	1.49	169	2,382	1.02	222
Observed mean	319	.91	.....	1,087	.46	.....
Computed 20-year mean	306	.88	.....	1,087	.46	.....

[a] Drainage area above gaging station—437 square miles, California Eng. Dept.; 266 square miles, U. S. Geol. Survey.
[b] Drainage area above drainage station—2,345 square miles.

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TABLE 27.—*Computation of run-off factor for drainage areas of Sierra Nevada streams.*

[Based on isohyets of Plate VII, p. 28.]

Season (Sept. 1 to Aug. 31).	Kings River.					Merced River.					Tuolumne River.				
	Average precipitation (from isohyets).	Season's precipitation.		Measured stream flow.		Average precipitation (from isohyets).	Season's precipitation.		Measured stream flow.		Average precipitation (from isohyets).	Season's precipitation.		Measured stream flow.	
		Per cent of mean.	Inches.	Inches.	Per cent of precipitation.		Per cent of mean.	Inches.	Inches.	Per cent of precipitation.		Per cent of mean.	Inches.	Inches.	Per cent of precipitation.
1878-79	33.5	54	18.1	12.6	70	41.6	.....	.....	.....	.....	42.5	75	31.9	16.0	50
1879-80	33.5	110	36.9	21.4	58	41.6	110	45.8	21.4	47	.....	120	51.0	29.0	57
1880-81	33.5	107	35.9	20.1	56	41.6	107	44.5	22.4	50	.....	86	36.6	23.5	64
1881-82	33.5	74	24.8	16.0	65	41.6	80	33.3	14.1	42	.....	75	31.9	17.9	56
1882-83	33.5	96	32.2	13.8	43	41.6	91	37.9	17.2	45	.....	86	36.6	16.4	45
1883-84	33.5	200	67.0	35.7	53	41.6	205	85.3	30.9	36	.....	138	58.6	26.6	45
1895-96	33.5	91	30.5	20.1	66	.....	.....	.....	.....	.....	45.3	92	41.7	19.3	46
1896-97	33.5	108	36.2	22.5	62	.....	.....	.....	.....	.....	45.3	113	51.2	30.0	59
1897-98	33.5	55	18.4	9.5	52	.....	.....	.....	.....	.....	45.3	55	24.9	11.8	47
1898-99	33.5	82	27.5	13.3	48	.....	.....	.....	.....	.....	45.3	85	38.5	16.8	44
1899-1900	33.5	104	34.8	13.7	39	.....	.....	.....	.....	.....	45.3	100	45.3	20.2	45
1900-1901	33.5	128	42.9	33.7	79	.....	.....	.....	.....	.....	45.3	142	64.3	33.0	51
1901-2	33.5	79	26.5	16.8	63	41.6	92	38.3	14.4	38	45.3	89	40.3	19.4	48
1902-3	33.5	89	29.8	18.2	61	41.6	104	43.3	16.7	39	45.3	107	48.5	23.8	49
1903-4	33.5	84	28.1	18.3	65	41.6	96	39.9	18.7	47	45.3	98	44.4	31.6	71
1904-5	33.5	124	41.5	15.6	38	41.6	101	42.0	15.7	37	45.3	113	51.2	21.2	41
1905-6	33.5	160	53.6	40.7	76	41.6	163	67.8	34.7	51	45.3	144	65.2	42.1	65
1906-7	33.5	137	45.9	29.9	65	41.6	140	58.2	36.6	63	45.3	152	68.9	45.1	65
1907-8	33.5	83	27.8	11.1	40	41.6	69	28.7	8.8	31	45.3	77	34.9	13.2	38
1908-9	33.5	123	41.2	30.0	73	41.6	126	52.4	25.5	49	45.3	110	49.8	27.7	56
1909-10	33.5	94	31.5	19.4	62	41.6	100	41.6	18.2	44	45.3	98	44.4	.....	.....
Mean	.....	104	34.8	20.6	59	.....	113	47.1	21.1	44	.....	103	45.7	24.2	52

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TABLE 27.—*Computation of run-off factor for drainage areas of Sierra Nevada streams*—Continued.

Season (Sept. 1 to Aug. 31).	Kaweah River.					Tule River.					Kern River.				
	Average precipitation (from isohyets).	Season's precipitation.		Measured stream flow.		Average precipitation (from isohyets).	Season's precipitation.		Measured stream flow.		Average precipitation (from isohyets).	Season's precipitation.		Measured stream flow.	
		Per cent of mean.	Inches.	Inches.	Per cent of precipitation.		Per cent of mean.	Inches.	Inches.	Per cent of precipitation.		Per cent of mean.	Inches.	Inches.	Per cent of precipitation.
1878–79	25.6	(54)	13.8	5.8	42	.....	.....	.....	.....	.....	18.8	(54)	10.2	3.4	33
1879–80	25.6	(110)	28.2	18.7	66	.....	.....	.....	.....	.....	18.8	(110)	20.7	6.2	30
1880–81	25.6	(107)	27.4	10.9	40	.....	.....	.....	.....	.....	18.8	(107)	20.1	7.7	38
1881–82	25.6	68	17.4	11.3	65	.....	.....	.....	.....	.....	18.8	(80)	15.0	3.8	25
1882–83	25.6	101	25.9	7.5	29	.....	.....	.....	.....	.....	18.8	(91)	17.1	3.7	22
1883–84	25.6	193	49.4	29.6	60	.....	.....	.....	.....	.....	18.8	(205)	38.5	13.6	35
1893–94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	52	9.8	4.9	50
1894–95	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	120	22.6	8.1	36
1895–96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	88	16.5	5.0	30
1896–07	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	106	19.9	7.1	36
1897–98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	75	14.1	2.4	17
1898–99	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	57	10.7	2.7	25
1899–1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	75	14.1	2.6	18
1900–1901	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.8	121	22.7	6.9	30
1901–2	.....	.....	.....	.....	.....	23.2	82	19.0	8.0	42	18.8	92	17.3	4.6	27
1902–3	.....	.....	.....	.....	.....	23.2	80	18.6	7.9	42	18.8	76	14.3	4.5	31
1903–4	26.5	71	18.8	13.2	70	23.2	70	16.2	4.9	30	18.8	70	13.2	3.7	28
1904–5	26.5	121	32.1	12.5	39	23.2	119	27.6	5.2	19	18.8	122	22.9	4.3	19
1905–6	26.5	156	41.3	38.7	94	23.2	172	39.9	23.3	58	18.8	159	29.9	14.2	48
1906–7	26.5	121	32.1	21.7	68	23.2	126	29.2	11.0	38	18.8	101	19.0	9.0	47
1907–8	26.5	91	24.1	9.1	38	23.2	102	23.7	5.8	24	18.8	82	15.4	.....	.....
1908–9	26.5	119	31.5	28.9	92	23.2	150	34.8	20.2	58	18.8	174	32.7	13.8	42
1909–10	26.5	95	25.2	.....	.....	23.2	96	22.2	.....	.....	18.8	100	18.8	.....	.....
Mean	.....	108	29.0	17.3	59	.....	111	25.7	10.8	39	.....	101	18.9	6.3	32

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TABLE 28.—*Monthly mean discharge, in second-feet, at United States Geological Survey stations, of creeks near Independence for season 1904–5.*

[Estimates and compilations by C. H. Lee, from published data in water-supply papers.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tabooose	4	6	4	3	2.5	3	3	2	6	16	12	7	5.7
Goodale	3	5	3	2.5	2	2.5	2.5	2	5	9	6	4.5	3.9
Division [a]	4	5	4	3.5	3	4	4	3	4	5	4	3	3.9
Oak	10	14	11	10	8	9	9	7	15	30	20	13	13.0
Little Pine	4.5	7	5	4	3.5	4	4	3	15	44	23.5	[b] 10.9	10.7
Lone Pine	6	8	6	4	3	4	4	2.5	12	33	25	11	9.9

[a] United States Geological Survey station at upper road. Length of seepage channel, 4 miles.
[b] United States Geological Survey measurement.

TABLE 29.—*Monthly mean discharge, in second-feet, at United States Geological Survey stations, of creeks near Independence for season 1905–6.*

[Compiled from published data in water-supply papers.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tabooose	[a] 4.5	[a] 4.5	[a] 3.8	[a] 4.5	3.7	2.9	3.3	5.8	10.4	21.8	46	26	11.4
Goodale	[a] 3	[a] 3	[a] 2.5	[a] 3	[b] 2.5	[b] 2.5	[b] 2.5	3.5	6.3	11.2	19.0	6.4	5.4
Division [c]	[a] 3	[a] 3	[a] 4	[a] 5	6.7	5.1	6.1	6.0	7.3	8.4	17.2	14.3	7.2
Sawmill	[a] 3	[a] 3	[a] 2.5	[a] 3	[b] 3	2.7	3.7	3.4	4.3	7.6	16.3	12.6	5.4
Oak	[a] 10	[a] 9	[a] 11	[a] 8	[b] 6	7.3	7.8	11.9	28	70	140	74	31.8
Little Pine	4.6	3.2	3.6	3.6	4.0	2.8	4.8	8.0	29.6	96	127	54	28.5
Shepard	[a] 2	[a] 1	[a] 2	[a] 2	[b] 2	[b] 2	[b] 2	9.0	26	62	104	63	23.1
Bairs	[a] 0.5	[a] 0.5	[a] 0.5	[a] 1	[b] 1	[b] 1	[b] 1	3.2	12.5	31	30	13	8.0
George	[a] 2	[a] 1	[a] 1	[a] 1	[b] 1	[b] 1	[b] 2	10.3	21.1	53	87	42	18.6
Lone Pine	[a] 4	[a] 3.5	[a] 4	[a] 4	[b] 3	2.9	3.8	7.2	28	74	129	68	27.6

[a] Estimated by C. H. Lee.
[b] Estimated by United States Geological Survey.
[c] Station at upper road.

TABLE 30.—*Monthly mean discharge, in second-feet, at United States Geological Survey stations, of creeks near Independence for season 1906–7.*

[Compiled from published data in water-supply papers.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Thesmaha	[a] 12.0	[a] 6.8	[a] 6.2	[a] 5.9	4.9	4.4	4.0	5.3	11.0	18.0	39.0	20.0	11.4
Tabooose	15.0	3.7	3.6	3.5	2.3	2.3	7.3	12.0	23.0	21.0	18.0	12.0	10.3
Goodale	5.9	5.6	5.3	4.3	3.9	3.6	3.3	5.1	7.0	10.2	15.1	10.3	6.6
Division [b]	10.9	12.6	11.5	10.1	10.6	10.8	11.2	10.1	9.7	11.1	12.4	10.1	10.9
Sawmill	9.8	6.7	[c] 5.0	[c] 5.0	[c] 5.2	[c] 5.4	[c] 5.0	[c] 5.0	[c] 8.0	[c] 17.0	[c] 12.0	[c] 7.0	7.6
Oak	32	20.5	11.8	11.3	10.8	10.4	12.2	18.8	27	42	57	33	23.9
Little Pine	22.9	12.4	6.1	5.2	5.5	3.5	4.9	14.9	26	62	70	36	22.5
Symmes	[c] 1.0	[c] 0	[c] 0	[c] 0	[c] 0	[c] 0	[c] 0	[c] 0.6	[c] 6.8	[c] 14.5	[c] 12.0	[c] 2.0	3.1
Shepard	12.0	2.6	[c] 0.5	[c] 3.0	2.0	2.4	3.4	8.1	14.0	26	37	21.0	11.0
Bairs	4.3	2.0	[c] 1.0	[c] 0.5	[c] 1.0	[c] 1.0	3.0	7.0	9.6	12.2	11.7	4.4	4.8
George	21.0	7.7	2.6	[c] 1.7	2.0	2.5	5.0	11.0	17.0	19.0	28.0	13.0	10.9
Lone Pine	27	14.0	8.0	8.0	8.2	6.5	8.8	19.5	[c] 30.0	45	62	40	23.1

[a] Estimated by C. H. Lee.
[b] Station at upper road, except from August 18 to September 18, when it was at Rickey ranch
[c] Estimated by United States Geological Survey.

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TABLE 31.—*Monthly mean discharge, in second-feet, at United States Geological Survey stations, of creeks near Independence for season 1907–8.*

[Compiled from published data in water-supply papers.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha	6.1	5.4	5.5	5.7	6.0	5.8	4.4	4.3	4.4	8.5	32	21.0	9.1
Taboose	5.0	4.2	3.6	3.2	3.0	2.3	2.3	3.1	4.9	6.0	10.9	8.2	4.7
Goodale	3.9	2.8	2.8	2.8	3.0	2.6	2.6	2.7	4.4	5.8	7.3	5.0	3.8
Division [a]	9.9	10.0	9.0	7.7	[b] 7.0	6.7	5.9	5.8	7.0	7.2	7.2	7.7	7.6
Sawmill	[c] 6.5	[c] 6.5	[c] 6.0	[c] 5.5	[c] 4.0	[c] 4.0	[c] 4.0	[c] 4.5	[c] 4.0	[c] 3.5	[c] 5.5	[c] 5.5	5.0
Thibaut, S. Fork	1.0	1.0	1.0	0.9	[c] 1.0	[c] 1.0	[c] 1.0	[c] 1.0	[c] 0.5	[c] 0.6	[c] 0.6	[c] 0.5	0.8
Oak	20.4	14.5	13.0	13.0	[b] 10.0	9.2	9.3	12.3	15.8	21.0	29	22.5	15.8
Little Pine	16.7	6.6	7.6	6.9	4.3	2.4	3.4	7.4	15.7	21.5	29	19.9	11.8
Symmes	0.5	0	0	0	[c] 0	[c] 0	[c] 0	[c] 0	[c] 2.0	[c] 2.5	[c] 3.0	[c] 1.5	0.8
Shepard	4.7	5.1	4.7	2.9	[c] 1.3	[c] 1.3	1.3	2.6	6.2	13.4	22.0	21.0	7.2
Bairs	1.1	1.7	2.1	1.5	[c] 1.0	[c] 0	[c] 0	1.2	3.0	4.0	4.5	4.0	2.0
George	4.0	5.2	3.8	2.3	2.7	1.9	2.2	.5.3	8.0	11.0	18.0	14.0	6.5
Lone Pine	11.5	19.6	16.2	8.5	[c] 8.0	7.7	8.2	11.3	17.4	32	44	58	20.2

[a] Station moved from upper road to intake of power plant No. 1, May 1. Length of seepage channel to old station, 4 miles.
[b] Estimated by United States Geological Survey.
[c] Estimated by C. H. Lee.

TABLE 32.—*Monthly mean discharge, in second-feet, at United States Geological Survey stations, of creeks near Independence for season 1908–9.*

[Compiled from published data in water-supply papers.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha	9.8	5.5	5.0	5.3	4.7	9.5	6.0	3.0	9.8	45.9	45.7	24.2	14.5
Taboose	6.4	4.5	4.0	5.5	4.3	4.0	2.7	4.9	8.7	25.7	22.6	10.2	8.6
Goodale	4.1	3.3	3.0	3.0	2.3	2.4	2.4	3.8	8.6	18.7	16.5	8.8	6.4
Division [a]	7.7	7.5	7.7	7.6	7.2	6.9	7.3	7.9	8.0	16.7	16.4	15.6	9.7
Sawmill	[b] 3.5	[b] 3.0	[b] 4.5	[b] 4.0	4.1	5.0	4.9	6.6	7.3	14.1	17.8	13.1	7.3
Thibaut, South Fork	[b] .4	[b] .2	[b] 0	[b] 0	0	0	0	1.8	2.6	2.8	2.0	1.0	.9
Oak	15.5	13.0	11.6	10.5	11.4	10.8	11.1	15.9	36.3	100.0	98.0	35.7	30.8
Little Pine	8.3	9.0	6.6	6.3	6.3	5.5	5.4	9.9	41.1	94.2	82.2	34.5	25.8
Pinyon [c]	1.8	2.0	2.0	1.5	1.9	1.7	1.7	4.0	8.0	5.0	9.5	2.4	3.5
Symmes	[b] 0	[b] 0	[b] 0	[b] 0	0	0	0	3.0	21.0	31.0	15.4	5.2	6.3
Shepard	9.6	5.7	2.6	[d] 2.0	4.7	3.0	2.5	8.8	14.8	37.9	42.4	20.6	12.9
Bairs	1.6	[d] 1.4	[d] 1.2	[d] 1.0	1.0	.5	1.5	7.7	13.0	24.0	15.2	5.0	6.1
George	8.1	6.0	3.2	3.0	2.8	2.3	3.2	11.4	19.4	43.7	38.4	14.7	13.0
Lone Pine	24.0	11.3	7.6	6.3	7.2	8.4	6.4	11.9	31.5	102.0	81.1	41.4	28.3

[a] United States Geological Survey station at intake of power plant No. 1.
[b] Estimated by C. H. Lee.
[c] Measured at junction of Pinyon ditch and Little Pine Creek by city of Los Angeles.
[d] Estimated by U. S. Geological Survey.

TABLE 33.—*Monthly mean discharge, in second-feet, at United States Geological Survey stations, of creeks near Independence for season 1909–10.*

[Compiled from published data in water-supply papers.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha	12.9	8.5	6.9	10.0	9.6	8.2	7.0	6.8	15.3	26.3	24.4	17.7	12.8
Taboose	5.7	4.0	3.6	5.7	4.9	3.1	3.5	3.9	7.2	12.1	10.6	7.0	5.9
Goodale	5.6	4.1	4.0	4.9	3.7	3.1	3.8	4.4	7.3	10.0	8.0	4.7	5.3
Division [a]	14.8	13.4	12.2	11.2	10.0	9.0	8.0	8.5	8.5	8.5	7.0	7.3	9.9
Sawmill	10.6	9.0	8.7	8.0	8.0	6.5	6.5	5.0	6.0	7.0	6.0	4.5	7.2
Thibaut	[b] .5	0	0	0	0	0	0	[b] .6	[b] .8	[b] .6	.3	.15	.25
Oak	19.6	15.0	15.6	14.0	12.0	11.0	11.6	15.4	27.8	34.1	30.4	14.4	18.4
Little Pine	16.1	7.2	9.5	10.2	8.4	7.0	6.1	13.6	32.5	45.7	35.5	14.2	17.2
Pinyon [c]	1.5	2.0	[b] 1.5	[b] 1.0	1.0	[b] 1.0	[b] 2.0	[b] 2.0	3.5	[b] 4.0	[b] 2.5	[b] 1.5	2.0
Symmes	[b] 2.0	0	0	0	0	0	0	.1	3.0	5.0	2.5	.8	1.1
Shepard	11.0	4.7	3.0	3.0	2.0	1.5	2.0	4.0	11.6	17.0	22.0	11.0	7.7
Bairs	3.9	1.2	1.0	1.0	.5	.15	.2	.9	8.7	6.3	3.9	1.4	2.4
George	8.7	3.5	2.0	1.9	1.5	1.2	3.0	5.8	16.3	17.2	13.6	6.4	6.8
Lone Pine	19.6	8.6	7.8	7.9	6.2	8.3	6.1	10.4	24.5	32.5	34.8	21.4	15.7

[a] United States Geological Survey station at intake of power plant No. 1.
[b] Estimated by C. H. Lee.
[c] Measured at junction of Pinyon ditch and Little Pine Creek.

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TABLE 34.—*Monthly mean discharge, in second-feet, at mouth of canyon, of creeks near Independence for season 1904–5.*

[Obtained from discharges at United States Geological Survey stations by use of percolation-loss diagrams.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Taboose	8.6	13.0	8.6	6.5	5.6	6.5	6.5	4.6	13.0	31.0	24.0	15.0	11.9
Goodale	5.8	9.5	5.8	5.0	3.8	5.0	5.0	3.8	9.5	17.0	12.0	8.5	7.6
Division [a]	7.6	9.5	5.9	4.8	3.6	4.6	4.8	5.9	7.6	9.5	7.6	5.9	6.4
Oak	12.0	18.0	13.0	12.0	9.2	10.0	10.0	8.0	20.0	43.0	23.0	17.0	16.7
Little Pine [b]	5.0	8.5	5.5	4.0	3.5	4.0	4.0	3.5	18.0	54.0	29.0	13.0	12.7
Lone Pine	6.0	8.0	6.0	4.0	3.0	4.0	4.0	2.5	12.0	33.0	25.0	11.0	9.9

[a] Includes flow from springs No. 1 and No. 2, 2 second-feet.
[b] Includes discharge of Pinyon ditch, 2 second-feet at junction.

TABLE 35.—*Monthly mean discharge, in second-feet, at mouth of canyon, of creeks near Independence for season 1905–6.*

[Obtained from discharges at United States Geological Survey stations by use of percolation-loss diagrams.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Taboose	9.5	9.5	8.5	9.5	8.0	6.4	7.2	12.0	21	37	61	41	19.2
Goodale	5.8	5.8	5.0	5.8	5.0	5.9	5.0	6.8	12	22	29	12	9.9
Division [a]	4.0	4.0	5.8	6.0	7.0	5.8	7.3	7.2	10	12	24	20	9.4
Sawmill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.5
Oak	12.0	11.0	13.0	9.2	6.0	8.0	8.5	14.0	40	106	180	112	43.3
Little Pine [b]	5.0	3.4	3.6	3.6	4.0	2.8	4.8	9.5	36	108	[c] 109	[c] 48	28.1
Shepard	6.0	4.5	4.5	4.5	4.5	4.5	4.5	17.0	44	80	122	81	31.4
Bairs	2.8	2.8	1.5	2.0	2.0	2.0	2.0	6.3	18	42	41	19	11.8
George	3.0	2.0	1.0	1.0	1.0	1.0	3.0	16.0	32	68	102	57	23.9
Lone Pine	4.0	3.5	4.0	4.0	3.0	2.9	3.8	7.2	28	74	129	68	27.6

[a] Includes flow from springs No. 1 and No. 2, 2.5 second-feet.
[b] Includes discharge of Pinyon ditch, 3.5 second-feet at junction.
[c] Seepage gain curve used.

TABLE 36.—*Monthly mean discharge, in second-feet, at mouth of canyon, of creeks near Independence for season 1906–7.*

[Obtained from discharges at United States Geological Survey stations by use of percolation-loss diagrams.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha [a]	11.0	5.8	5.2	4.9	3.9	3.4	3.0	4.3	8	15	39	20.0	10.3
Taboose	30.0	7.8	7.6	7.5	5.5	5.5	15.0	25.0	38	36	33	25.0	20.5
Goodale	11.0	10.0	10.0	8.5	7.3	7.0	6.3	9.8	13	20	25	20.0	12.3
Division [b]	21.0	15.0	13.0	11.0	11.0	11.0	12.0	11.0	13	15	17	14.0	13.7
Sawmill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9.1
Oak	47.0	28.0	15.0	14.0	13.0	12.0	15.0	26.0	39	63	86	48.0	33.8
Little Pine [c]	28.0	15.0	7.0	5.9	6.1	3.5	5.1	18.0	32	74	[d] 62	[d] 32.0	24.0
Symmes	5.2	4.0	2.0	2.0	2.0	2.0	2.5	4.5	12	22	19	6.6	7.0
Shepard	22.0	7.1	3.0	5.5	4.5	4.9	5.9	16.0	24	43	55	36.0	18.9
Bairs	7.8	4.8	2.0	1.5	2.0	2.0	4.0	11.0	14	18	17	8.0	7.7
George	32.0	12.0	4.0	2.0	3.5	3.9	7.7	16.0	26	29	42	20.0	16.5
Lone Pine	27.0	14.0	8.0	8.0	8.2	6.5	8.8	19.5	30	45	62	40.0	23.1

[a] United States Geological Survey discharges are corrected for combined seepage loss from channel and gain from irrigation waste and springs.
[b] Includes flow from springs No. 1 and No. 2, 2.5 second-feet.
[c] Includes discharge of Pinyon ditch, 3.5 second feet at junction.
[d] Seepage gain curve used.

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TABLE 37.—*Monthly mean discharge, in second-feet, at mouth of canyon, of creeks near Independence for season 1907–8.*

[Obtained from discharges at United States Geological Survey stations by use of percolation-loss diagrams.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha [a]	5.1	4.4	4.5	4.7	5.0	4.8	3.4	3.3	3.4	6.5	32.0	21.0	8.2
Taboose	10.0	8.9	7.6	6.9	6.5	5.2	5.2	6.7	10.0	12.0	22.0	17.0	9.9
Goodale	7.4	5.2	5.2	5.2	5.8	5.0	5.0	5.1	8.4	11.0	14.1	9.5	7.2
Division [b]	12.3	12.5	10.8	8.8	7.6	7.0	7.3	7.2	8.8	9.0	9.9	11.2	9.4
Sawmill [c]	8.5	8.0	7.0	6.0	4.0	4.0	4.0	4.5	4.5	4.0	6.0	6.0	5.5
Oak	28.0	19.0	17.0	17.0	12.0	11.0	11.0	16.0	21.0	29.0	42.0	32.0	21.2
Little Pine [d]	20.0	8.0	9.0	8.0	4.3	2.4	3.4	9.0	19.0	26.0	35.0	24.0	14.0
Symmes	4.8	2.0	2.0	2.0	1.5	1.0	1.5	2.0	6.7	7.2	7.7	5.8	3.7
Shepard	10.0	11.0	7.5	5.4	3.8	3.8	3.8	7.0	13.0	24.0	37.0	36.0	13.3
Bairs	3.5	4.5	3.1	2.5	2.0	1.0	1.0	3.5	6.0	7.5	8.0	7.5	4.2
George	6.0	8.0	6.0	3.5	4.2	2.5	3.5	8.0	12.0	16.0	27.0	21.0	9.8
Lone Pine	11.5	19.6	16.2	8.5	8.0	7.7	8.2	11.3	17.4	32.0	44.0	58.0	20.2

[a] United States Geological Survey discharges are corrected for combined seepage loss from channel, and gain from irrigation waste and springs.
[b] Includes flow from Springs No. 1 and No. 2, 2.5 second-feet.
[c] Estimated by C. H. Lee.
[d] Includes discharge of Pinyon ditch, 2 second-feet at junction.

TABLE 38.—*Monthly mean discharge, in second-feet, at mouth of canyon, of creeks near Independence for season 1908–9.*

[Obtained from discharges at United States Geological Survey stations by use of percolation-loss diagrams.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha [a]	8.8	4.5	4.0	4.3	3.6	8.6	5.0	2.1	7.0	43	45.7	24.2	13.4
Taboose	13.2	9.5	8.4	11.4	9.0	8.4	6.0	10.0	17.8	40	37.4	20.9	16.0
Goodale	7.8	6.3	5.7	5.7	4.6	4.6	4.6	7.3	16.3	29	26.6	16.7	11.2
Division [b]	10.9	10.0	9.2	8.6	7.4	7.5	7.8	8.0	8.0	20	19.0	18.0	11.2
Sawmill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.3
Oak	20.4	16.5	14.3	12.6	14.4	13.5	14.0	21.0	54.0	140	138.0	52.0	42.6
Little Pine [d]	9.8	10.7	7.6	6.9	7.0	5.6	5.5	12.0	50.0	116	[e]71.8	[e]31.0	27.8
Pinyon	2.6	3.1	3.1	2.3	2.7	2.5	2.5	6.4	13.3	[f]35	[f]25.0	[f]11.1	9.2
Symmes [g]	[f]2.0	[f]2.0	[f]2.0	[f]2.0	[f]2.0	[f]1.8	[f]2.5	7.9	30.0	42	23.2	10.5	10.7
Shepard	17.9	11.9	5.1	4.5	7.2	5.5	5.0	16.6	25.8	56	60.0	35.0	20.9
Bairs	4.4	4.2	2.2	2.0	2.0	1.5	2.5	12.0	19.0	33	21.7	8.7	9.4
George	12.3	9.1	4.8	4.6	4.1	3.7	5.0	17.1	29.3	59	53.0	22.2	18.7
Lone Pine	24.0	11.3	7.6	6.3	7.2	8.4	6.4	11.9	31.5	102	81.1	41.4	28.3

[a] United States Geological Survey discharges are corrected for combined seepage loss from channel and gain from irrigation waste and springs.
[b] Includes flow from springs No. 1 and No. 2, 2.5 second-feet.
[c] Power plant No. 2 put in operation and No. 1 shut down. No. 2 carried 6 second-feet.
[d] Includes discharge of Pinyon ditch, 3.5 second-feet at junction.
[e] Seepage-gain curve used.
[f] Obtained by interpolation between mouth of canyon measurements.
[g] Includes discharge of North Fork, seasonal mean, 0.5 second-foot.

TABLE 39.—*Monthly mean discharge, in second-feet, at mouth of canyon, of creeks near Independence for season 1909–10.*

[Obtained from discharges at United States Geological Survey stations by use of percolation-loss diagrams.]

Creek.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Mean.
Tinemaha [a]	11.9	7.5	5.9	9.0	8.6	7.2	6.0	5.8	14.3	23.3	24.4	17.7	12.0
Taboose	12.0	8.6	7.7	12.0	10.2	6.6	7.5	8.3	14.8	24.5	21.7	14.4	12.4
Goodale	10.6	8.0	7.8	9.5	7.0	5.8	7.2	8.5	14.0	19.0	15.4	9.0	10.2
Division [b]	19.3	17.6	[c]15.0	12.2	10.0	9.0	8.5	10.0	10.4	11.0	10.0	10.6	12.0
Sawmill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.2
Oak	27.0	19.5	20.5	18.2	15.0	13.5	14.5	20.2	39.5	48.4	44.0	18.8	25.0
Little Pine [d]	[c]15.0	8.8	[c]10.0	[c]10.0	10.2	8.1	6.5	16.2	39.2	56.0	[e]31.0	[c]13.0	18.7
Pinyon	[f]5.0	[f]3.5	[f]2.0	[f]1.0	[f]1.6	[f]1.6	[f]2.6	[f]2.6	[f]5.0	[c]10.0	[e]5.0	[c]2.0	3.5
Symmes [g]	6.7	[c]4.0	[c]4.0	[f]3.0	[f]2.0	[f]2.0	[f]2.0	4.2	7.8	10.4	7.2	5.0	4.9
Shepard	20.0	10.3	5.5	5.5	4.5	4.0	4.5	9.1	21.0	29.2	37.0	20.2	14.2
Bairs	7.2	3.8	2.0	2.0	1.5	1.2	1.2	3.3	13.4	10.4	7.2	4.0	4.8
George	13.4	5.6	3.2	3.0	2.2	1.6	4.6	9.0	25.0	26.0	20.5	9.6	10.3
Lone Pine	19.6	8.6	7.8	7.9	6.2	8.3	6.1	10.4	24.5	32.5	34.8	21.4	15.7

[a] U. S. Geological Survey discharges are corrected for combined seepage loss from channel and gain from irrigation waste and springs.
[b] Includes flow from springs No. 1 and No. 2, 2.5 second-feet.
[c] Estimated by C. H. Lee.
[d] Includes discharge of Pinyon ditch, 2.0 second-feet at junction.
[e] Seepage-gain curve used.
[f] Obtained by interpolation between mouth of canyon measurements.
[g] Discharge of North Fork, 0 second-foot.

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TABLE 40.—*Seasonal discharge, in second-feet per square mile, at mouth of canyon, of creeks near Independence.*

[Figures in parentheses are assumed.]

Creek.	Year beginning Sept. 1—						Observed 6-year mean.	Computed 21-year mean.	Assumed 21-year mean.
	1904	1905	1906	1907	1908	1909			
Class A.									
Tinemaha	.....	.....	1.97	1.56	2.56	2.29	2.09	1.92	.....
Taboose	1.70	2.74	2.92	1.40	2.29	1.77	2.14	1.81	.....
Goodale	1.53	1.99	2.47	1.45	2.26	2.05	1.96	1.66	.....
Dry Canyon	.....	.....	.....	.....	.....	.....	.....	.....	1.70
Division	(1.13)	1.78	2.89	1.78	2.24	2.45	2.04	1.73	.....
Oak	1.09	2.81	2.20	1.38	2.77	1.63	1.98	1.68	.....
Little Pine	1.27	2.92	2.44	1.42	2.88	1.98	2.15	1.82	.....
Average	1.34	2.45	2.48	1.50	2.50	2.03	2.06	1.75	.....
Class B.									
Shepard	(0.90)	2.56	1.54	1.10	1.70	1.15	1.49	1.26	.....
George	(.90)	2.62	1.81	1.08	2.06	1.13	1.60	1.36	.....
Lone Pine	.83	2.31	1.94	1.69	2.37	1.31	1.74	1.47	.....
Average	.88	2.50	1.76	1.29	2.04	1.20	1.61	1.36	.....
Class C.									
Pinyon	.....	.....	.....	.....	2.14	0.82	.....	.....	1.11
Symmes	.....	.....	1.66	0.88	2.42	1.16	(1.47)	1.25	.....
Average	.....	.....	1.66	.88	2.28	.99	(1.39)	1.18	.....
Class D.									
Bairs	(0.62)	1.71	1.11	0.61	1.36	0.69	1.02	0.86	.....
Hogback	.....	.....	.....	.....	.....	.....	.....	.....	1.00
Class E.									
Sawmill	(0.52)	0.85	1.19	0.72	0.96	1.02	0.86	0.73	.....

Class A, north of Kings-Kern divide, 60 per cent or more of area above 10,000 feet.
Class B, south of Kings-Kern divide, 60 per cent or more of area above 10,000 feet.
Class C, north of Kings-Kern divide, less than 60 per cent of area above 10,000 feet.
Class D, south of Kings-Kern divide, less than 60 per cent of area above 10,000 feet.
Class E, small run-off for unknown reason, less than 60 per cent of area above 10,000 feet.

TABLE 41.—*Seasonal discharges at mouth of canyon, expressed as percentages of observed 6-year mean, for streams near Independence.*

[Figures in parentheses are assumed.]

Stream.	Year beginning Sept. 1—						Average.
	1904	1905	1906	1907	1908	1909	
Class A.							
Tinemaha	.....	.....	94	75	123	110	100
Taboose	79	128	136	65	107	83	100
Goodale	78	102	126	74	115	105	100
Division	(55)	87	142	87	110	120	100
Oak	55	142	111	70	140	82	100
Little Pine	59	136	114	66	134	92	100
Average	65	119	120	73	122	99	100

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TABLE 41.—*Seasonal discharges at mouth of canyon, expressed as percentages of observed 6-year mean, for streams near Independence*—Continued.

[Figures in parentheses are assumed.]

Stream.	Year beginning Sept. 1—						Average.
	1904	1905	1906	1907	1908	1909	
Class B.							
Shepard	(60)	172	103	74	114	77	100
George	(56)	164	113	68	129	71	100
Lone Pine	48	133	112	97	136	75	100
Average	57	156	109	79	126	74	100
Class C.							
Pinyon	.....	.....	.....	.....	.....	.....	.....
Symmes	.....	.....	113	60	165	79	104
Average	.....	.....	113	60	165	79	104
Class D.							
Bairs	(61)	168	109	60	133	68	100
Class E.							
Sawmill	(60)	99	138	84	112	109	100
West slope of Sierra Nevada.							
Kings	64	167	122	46	123	79	100
Merced	68	149	157	38	109	78	100

TABLE 42.—*Seasonal discharges at mouth of canyon, expressed as percentages of computed 21-year mean, for streams near Independence.*

[Figures in parentheses are estimated.]

Stream.	Year beginning Sept. 1—						Average.
	1904	1905	1906	1907	1908	1909	
Class A.							
Tinemaha	.....	.....	104	83	135	121	111
Taboose	94	151	161	77	127	98	118
Goodale	92	120	149	87	136	124	118
Division	65	103	167	103	129	142	118
Oak	65	167	131	82	165	97	118
Little Pine	70	160	134	78	158	109	118
Average	77	140	141	85	142	116	117
Class B.							
Shepard	(71)	202	122	87	135	91	118
George	(66)	193	133	79	151	83	118
Lone Pine	56	157	132	115	161	89	118
Average	64	184	129	94	149	88	118

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TABLE 42.—*Seasonal discharges at mouth of canyon, expressed as percentages of computed 21-year mean, for streams near Independence*—Continued.

[Figures in parentheses are estimated.]

Stream.	Year beginning Sept. 1—						Average.
	1904	1905	1906	1907	1908	1909	
Class C.							
Pinyon							
Symmes			133	70	194	93	122
Average			133	70	194	93	122
Class D.							
Bairs	(72)	199	129	71	158	80	118
Class E.							
Sawmill	(71)	116	163	99	132	129	118
West slope of Sierra Nevada.							
Kings	76	197	145	54	145	94	118
Merced	79	174	184	45	128	92	117

TABLE 43.—*Seasonal discharge, in second-feet, at mouth of canyon, of creeks tributary to Independence region.*

[Figures in parentheses are estimated.]

Creek.	Year beginning Sept. 1—						Observed 6-year mean.	Computed 21-year mean.
	1904	1905	1906	1907	1908	1909		
Taboose	11.9	19.2	20.4	9.8	16.0	12.4	15.0	12.7
Goodale	7.6	9.9	12.3	7.2	11.2	10.2	9.8	8.3
Dry Canyon	(3.9)	(5.1)	(6.3)	(3.7)	(5.7)	(5.2)	5.0	4.2
Division	(4.4)	6.9	11.2	6.9	8.7	9.5	7.9	6.7
Sawmill	(4.0)	6.5	9.1	5.5	7.3	7.2	6.6	5.6
Thibaut	(1.9)	(3.1)	(4.4)	(2.7)	(3.5)	(3.4)	3.2	2.7
Oak	16.7	43.2	33.8	21.2	42.6	25.0	30.4	25.8
Little Pine	10.7	24.6	20.5	12.0	24.3	16.7	18.1	15.3
Pinyon	(3.6)	(8.9)	(6.6)	(4.2)	9.2	3.5	6.0	4.8
Symmes	(3.5)	(8.8)	7.0	3.7	10.2	4.9	6.2	5.3
Shepard	(11.1)	31.4	18.9	13.5	20.9	14.1	18.3	15.5
Bairs	(4.3)	11.8	7.7	4.2	9.4	4.8	7.0	5.9
George	(8.2)	23.8	16.5	9.8	18.7	10.3	14.6	12.4
Hogback	(2.8)	(7.8)	(5.7)	(4.2)	(6.8)	(3.7)	5.2	4.4
	94.6	211.0	180.4	108.6	194.5	130.9	153.3	129.6

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TABLE 44.—*Seasonal discharge, in second-feet, at United States Geological Survey stations, of creeks tributary to Independence region.*

[Figures in parentheses are estimated.]

Creek.	Year beginning Sept. 1—						Observed 5-year mean.	Computed 21-year mean.
	1904	1905	1906	1907	1908	1909		
Taboose	(5.7)	11.4	10.3	4.7	8.6	5.9	8.2	6.5
Goodale	(3.9)	5.4	6.6	3.8	6.4	5.3	5.5	4.3
Dry Canyon	0	0	0	0	0	0	0	0
Division	(3.9)	7.2	10.9	7.6	9.7	9.9	9.1	7.3
Sawmill	.....	5.4	(7.6)	(5.0)	7.3	7.2	6.5	5.1
Thibaut	(0.5)	(1.0)	(1.0)	.8	.9	.2	.6	.5
Oak	(13.0)	31.8	23.9	15.8	30.8	18.4	24.1	19.0
Little Pine / Pinyon	(10.7)	28.5	22.5	11.8	25.8	17.2	21.2	16.7
Symmes	.....	(2.8)	3.1	.8	6.3	1.1	2.8	2.2
Shepard	.....	23.1	11.0	7.2	12.9	7.7	12.5	9.8
Bairs	.....	8.0	4.8	2.0	6.1	2.4	4.7	3.7
George	.....	18.6	10.9	6.5	13.0	6.8	11.2	8.8
Hogback	(0)	(1.0)	(.5)	(0)	(.5)	0	.4	.3
	.....	144.2	113.1	66.0	128.3	82.1	106.7	84.0
Per cent of totals at mouth of canyon	.....	68	63	61	66	63	65	65

TABLE 45.—*Analysis of flow of Owens River between Charlies Butte and Mount Whitney bridge, 1908.*

[Figures in parentheses are estimated.]

Month.	Discharge into river channel.						Diversions.		Discharge of Owens River at Mount Whitney bridge.		Seepage gain or loss.
	Owens River at Charlies Butte.	Slough near Goose Lake.[a]	Slough at Lake ranch.[b]	Shepard Creek.	Bairs and Georges creeks.	Miscellaneous.[c]	East Side canal.	Stevens ditch.	Computed.	Measured.	
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
January	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
February	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May	58	0	0	0	0	2	15	10	35	(32)	+17
June	57	0	0	0	0	2	15	15	29	(53)	+24
July	187	0	0	0	0	2	15	15	159	164	+ 5
August	266	0	0	0	0	2	15	15	238	234	4
September	172	0	0	0	0	2	15	15	144	145	+ 1
October	290	0	0	0	0	2	10	10	272	284	+12
November	382	(1)	(5)	0	0	2	10	7	373	374	+ 1
December	392	(3)	(13)	0	0	2	2	0	408	396	−12

[a] Portion of Blackrock Springs and occasional surface run-off.
[b] Includes discharge of Little Pine, Oak, and Sawmill creeks, surplus flow of Blackrock Springs, and occasional surface run-off.
[c] Includes waste of Seeley and Campbell springs and of Red Mountain and Taboose creeks.

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TABLE 46.—*Analysis of flow of Owens River between Charlies Butte and Mount Whitney bridge, 1909.*

[Figures in parentheses are estimated.]

Month.	Discharge into river channel.						Diversions.		Discharge of Owens River at Mount Whitney bridge.		Seepage gain or loss.
	Owens River at Charlies Butte.	Slough near Goose Lake.[a]	Slough at Lake ranch.[b]	Shepard Creek.	Bairs and Georges creeks.	Miscellaneous.[c]	East Side canal.	Stevens ditch.	Computed.	Measured.	
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
January	612	(10)	(18)	0	0	2	1.0	6.0	635	571	− 64
February	544	(6)	(18)	0	0	2	1.5	6.0	562	590	+ 28
March	394	(4)	(7)	0	0	2	10.7	6.9	389	401	+ 12
April	309	(2)	0	0	0	2	20.3	14.0	279	312	+ 33
May	140	(0.5)	0	0	0	2	20.5	9.5	112	127	+ 15
June	901	0	72	27	36	14	17.0	6.0	1,027	836	−191
July	958	0	80	22	22	13	23.8	3.0	1,068	1,056	− 12
August	284	0	9	1.6	0.3	2	18.9	0	278	280	+ 2
September	211	0	0	0	0	2	14.8	0	198	214	+ 16
October	311	0	0	0	0	2	14.8	0	298	318	+ 20
November	438	(1)	(7)	0	0	2	15.0	0	433	450	+ 17
December	525	(3)	(10)	0	0	2	14.5	0	526	519	− 7
Mean.	469	2.2	18.4	4.2	4.8	3.9	14.4	4.3	484	473	− 11

[a] Portion of Blackrock Springs.
[b] Includes discharge of Little Pine, Oak, and Sawmill creeks, surplus flow of Blackrock Springs, and occasional surface run-off.
[c] Includes waste of Seeley and Campbell springs and of Red Mountain and Taboose creeks.

TABLE 47.—*Analysis of flow of Owens River between Charlies Butte and Mount Whitney bridge, 1910.*

[Figures in parentheses are estimated.]

Month.	Discharge into river channel.						Diversions.		Discharge of Owens River at Mount Whitney bridge.		Seepage gain or loss.
	Owens River at Charlies Butte.	Slough near Goose Lake.[a]	Slough at Lake ranch.[b]	Shepard Creek.	Bairs and Georges creeks.	Miscellaneous.[c]	East Side canal.	Lower East Side canal.[d]	Computed.	Measured.	
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
January	655	12.5	27.7	0	0	2	0	(2.9)	694	713	+ 19
February	499	3.0	19.4	0	0	2	0	9.0	514	487	− 27
March	510	2.0	5.9	0	0	2	4.6	9.0	506	475	− 31
April	164	1.0	1.9	0	0	2	16.0	.8	152	184	+ 32
May	254	.3	.2	0	0	2	24.4	23.4	208	196	− 12
June	428	0	0	(2)	(1)	2	(23.0)	(30.0)	380	349	− 31
July	272	0	0	0	0	2	(23.0)	(30.0)	221	218	− 3
August	145	0	0	0	0	2	(20.0)	(20.0)	107	110	+ 3
September	110	0	0	0	0	2	(15.0)	(15.0)	82	95	+ 13
October	289	0	0	0	0	3	(15.0)	(15.0)	262	247	− 15
November	418	(1)	(5)	0	0	4	(15.0)	0	413	388	− 25
December	468	(3)	(8)	0	0	5	(15.0)	0	469	442	− 27
Mean.	351	1.9	5.7	0.2	0.1	2.5	14.2	12.9	334	325	− 9

[a] Portion of Blackrock Springs.
[b] Includes discharge of Little Pine, Oak, and Sawmill creeks, surplus flow of Blackrock Springs, and occasional surface run-off.
[c] Includes waste of Seeley and Campbell springs and of Red Mountain and Taboose creeks.
[d] Stevens ditch not diverting from river in 1910.

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TABLE 48.—*Comparison of evaporation from snow and water in Little Bear Valley, Cal.*

[Elevation, 5,150 feet.]

Time.	Depth of evaporation from water (inches).	Depth of evaporation from snow—equivalent water in inches.[a]		Ratio of snow to water evaporation.[b]	Precipitation (inches).
		Total.	Daily average.		
March, 1895	1.12	2.48	0.08	2.21	8.52
March, 1896	.94	3.79	.12	4.03	4.21
January, 1897	.57	1.58	.05	2.78	5.16
February, 1897	.24	2.82	.10	11.75	12.05
March, 1897	[c] .48	3.12	.10	6.50	10.17

[a] Snow heavy and wet, reduced to water, 5 to 1.
[b] Variation due to winds from sea or desert.
[c] Estimated.

TABLE 49.—*Depth of evaporation, in inches, from water surface near Independence (pan in water).*

Month.	1908		1909		1910		1911		Average per cent of annual evaporation.
	Total.	Rate per 24 hours.	Total.	Rate per 24 hours.	Total.	Rate per 24 hours.	Total.	Rate per 24 hours.	
January	.....	.....	1.60	0.052	1.75	0.056	1.65	0.053	2
February	.....	.....	2.40	.086	2.50	.089	2.35	.084	4
March	.....	.....	4.70	.152	5.15	.166	3.70	.119	7
April	.....	.....	7.30	.243	7.05	.235	6.25	.208	11
May	.....	.....	9.60	.310	8.29	.267	8.01	.258	13
June	.....	.....	10.10	.337	9.90	.330	.....	.....	15
July	.....	.....	10.40	.335	8.50	.274	.....	.....	14
August	[a] 4.90	0.222	8.00	.258	8.20	.264	.....	.....	12
September	5.30	.176	6.60	.220	6.30	.210	.....	.....	10
October	3.50	.113	3.90	.126	4.20	.135	.....	.....	6
November	2.50	.083	2.60	.087	2.36	.079	.....	.....	4
December	1.50	.048	(1.85)	.060	1.24	.040	.....	.....	2
	.....	.....	69.05	.189	65.44	.179	.....	.....	100

[a] Aug. 10 to 31, inclusive.

TABLE 50.—*Depth of evaporation, in inches, from water surface near Independence (pan in soil).*

Month.	1909			1910			1911		
	Total.	Rate per 24 hours.	Per cent of evaporation from pan in water.	Total.	Rate per 24 hours.	Per cent of evaporation from pan in water.	Total.	Rate per 24 hours.	Per cent of evaporation from pan in water.
January	.....	.....	.....	.....	.....	.....	2.25	0.073	138
February	.....	.....	.....	.....	.....	.....	2.25	.080	95
March	.....	.....	.....	[a] 4.25	0.236	.....	4.80	.155	130
April	.....	.....	.....	9.50	.316	135	8.12	.271	130
May	.....	.....	.....	10.61	.342	128	10.25	.330	128
June	.....	.....	.....	11.95	.398	121	.....	.....	.....
July	.....	.....	.....	12.55	.405	148	.....	.....	.....
August	10.70	0.345	134	11.80	.381	144	.....	.....	.....
September	8.50	.283	129	8.80	.293	140	.....	.....	.....
October	5.80	.187	149	5.60	.180	133	.....	.....	.....
November	3.80	.127	146	2.85	.095	121	.....	.....	.....
December	.....	.....	.....	1.60	.052	129	.....	.....	.....
	.....	.....	.....	.....	.....	133	.....	.....	.....

[a] Mar. 14 to 31, inclusive.

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TABLE 51.—*Depth of evaporation, in inches, from water surface near Independence (deep tank in soil).*

Month.	1909			1910			1911			Per cent of annual evaporation.
	Total.	Rate per 24 hours.	Per cent of evaporation from pan in water.	Total.	Rate per 24 hours.	Per cent of evaporation from pan in water.	Total.	Rate per 24 hours.	Per cent of evaporation from pan in water.	
January	.....	.....	.....	2.00	0.064	114	2.30	0.074	139	3
February	.....	.....	.....	2.90	.104	116	2.55	.091	108	4
March	.....	.....	.....	5.60	.180	109	3.95	.127	107	8
April	[a] 2.90	0.193	.....	7.40	.246	105	6.80	.226	84	11
May	7.50	.242	78	7.71	.248	93	7.90	.254	77	11
June	7.80	.260	77	8.60	.287	87	.....	.....	.....	12
July	7.90	.254	76	8.30	.268	98	.....	.....	.....	12
August	8.20	.264	102	8.80	.284	107	.....	.....	.....	13
September	7.20	.240	109	7.30	.243	116	.....	.....	.....	11
October	5.00	.161	128	5.15	.166	123	.....	.....	.....	7
November	3.30	.110	127	3.10	.103	131	.....	.....	.....	5
December	(2.20)	.071	119	2.15	.069	173	.....	.....	.....	3
	.....	.....	.....	69.01	.188	106	.....	.....	.....	100

[a] Apr. 16 to 30, inclusive.

TABLE 52.—*Depth of evaporation from ground surface near Independence, tank set No. 1.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches)	Rate in inches per 24 hours.	
1910.								
June	85	5.82	5.80	−1	86	3.18	0.102	1.55
July	98	5.80	5.80	0	98	3.62	.117	1.47
August	121	5.80	5.91	+4	117	4.33	.140	1.45
September	113	5.91	5.73	−6	119	4.40	.147	1.23
October	103	5.73	5.82	+3	100	3.70	.119	1.26
November	67	5.82	5.72	−3	70	2.59	.086	1.04
December	68	5.72	5.83	+4	64	2.38	.077	.92
1911.								
January	70	5.83	5.89	+2	68	2.52	.081	1.06
February	87	5.89	5.89	0	87	3.22	.115	1.07
March	79	5.89	5.77	−4	83	3.07	.099	1.16
April	91	5.77	5.80	+1	90	3.33	.111	1.57
May	98	5.80	5.81	0	98	3.61	.116	1.59
Year	1,080	5.82	5.81	0	1,080	39.95	.109	1.28

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TABLE 53.—*Depth of evaporation from ground surface near Independence, tank set No. 2.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches)	Rate in inches per 24 hours.	
1910.								
June	0	1.49	1.33	−5	5	0.18	0.006	4.70
July	22	1.33	1.32	−3	25	.93	.030	5.01
August	60	1.23	1.36	+4	56	2.07	.067	4.99
September	44	1.36	1.42	+2	42	1.55	.056	4.91
October	17	1.42	1.21	−7	24	.89	.029	4.92
November	7	1.21	1.13	−3	10	.37	.012	4.98
December	5	1.13	1.10	−1	6	.22	.007	4.97
1911.								
January	6	1.10	1.15	+2	4	.15	.005	4.98
February	0	1.15	1.11	−1	1	.04	.001	4.95
March	3	1.11	1.14	+1	2	.07	.002	4.94
April	10	1.14	1.18	+1	9	.33	.011	4.94
May	30	1.18	1.19	0	30	1.11	.036	4.98
Year	204	1.49	1.19	−10	214	7.91	.022	4.94

TABLE 54.—*Depth of evaporation from ground surface near Independence, tank set No. 3.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches)	Rate in inches per 24 hours.	
1910.								
June	24	1.19	0.32	−28	52	1.92	0.064	4.50
July	103	.32	.38	+ 2	101	3.74	.121	4.51
August	145	.38	1.01	+20	125	4.63	.149	4.52
September	89	1.01	.53	−15	104	3.85	.128	4.48
October	57	.53	.42	− 4	61	2.26	.073	4.44
November	16	.42	.18	− 8	24	.89	.030	4.43
December	14	.18	.14	− 1	15	.56	.018	4.49
1911.								
January	9	.14	.10	− 1	10	.37	.012	4.53
February	18	.10	.23	+ 4	14	.52	.019	4.59
March	12	.23	.20	− 1	13	.48	.015	4.48
April	40	.20	.54	+11	29	1.07	.036	4.50
May	62	.54	.60	+ 2	60	2.22	.072	4.49
Year	589	1.19	.60	−19	608	22.51	.062	4.49

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TABLE 55.—*Depth of evaporation from ground surface near Independence, tank set No. 4.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches).	Rate in inches per 24 hours.	
1910.								
June	54	2.16	2.29	+ 4	50	1.85	0.062	4.07
July	128	2.29	2.84	+18	110	4.07	.131	4.11
August	146	2.84	3.03	+ 6	140	5.18	.167	4.08
September	81	3.03	2.62	−13	94	3.48	.116	3.96
October	65	2.62	2.71	+ 3	62	2.29	.074	3.99
November	16	2.71	2.22	−16	32	1.18	.038	3.84
December	− 6	2.22	1.53	−22	16	.59	.019	3.84
1911.								
January	7	1.53	1.49	− 1	8	.30	.010	3.97
February	− 8	1.49	1.18	−10	2	.07	.002	3.36
March	3	1.18	1.19	0	3	.11	.004	3.74
April	62	1.19	2.15	+31	31	1.15	.038	4.00
May	96	2.15	2.57	+14	82	3.04	.098	4.06
Year	644	2.16	2.57	+14	630	23.31	.064	3.92

TABLE 56.—*Depth of evaporation from ground surface near Independence, tank set No. 5.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches).	Rate in inches per 24 hours.	
1910.								
June	69	3.04	3.88	+27	42	1.56	0.052	3.11
July	151	3.88	5.09	+39	112	4.15	.134	3.00
August	169	5.09	4.73	−12	181	6.70	.216	2.97
September	117	4.73	3.90	−27	144	5.33	.177	2.92
October	83	3.90	3.56	−11	94	3.48	.112	2.94
November	17	3.56	2.95	−20	37	1.37	.046	2.89
December	4	2.95	2.55	−13	17	.63	.020	2.96
1911.								
January	8	2.55	2.43	− 4	12	.44	.0 4	3.01
February	6	2.43	2.42	0	6	.22	.008	2.47
March	3	2.42	2.36	− 2	5	.18	.006	2.73
April	88	2.36	3.65	+42	46	1.70	.057	2.99
May	141	3.65	4.09	+14	127	4.70	.151	3.01
Year	856	3.04	4.09	+33	823	30.46	.084	2.92

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TABLE 57.—*Depth of evaporation from ground surface near Independence, tank set No. 6.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches).	Rate in inches per 24 hours.	
1910.								
June	119	5.50	5.65	+ 5	114	4.22	0.141	2.15
July	156	5.65	5.76	+ 4	152	5.62	.181	2.31
August	209	5.76	5.50	− 8	217	8.04	.259	2.36
September	180	5.50	4.07	−46	226	8.36	.278	1.93
October	99	4.07	3.86	− 7	106	3.92	.126	1.85
November	25	3.86	3.38	−16	41	1.52	.051	1.80
December	0	3.38	3.03	−11	11	.41	.013	1.85
1911.								
January	12	3.03	3.19	+ 5	7	.26	.008	1.92
February	9	3.19	3.17	− 1	10	.37	.013	1.31
March	24	3.17	3.32	+ 5	19	.70	.023	1.70
April	94	3.32	3.53	+ 7	87	3.22	.107	2.00
May	163	3.53	3.54	0	163	6.03	.195	1.99
Year	1,090	5.50	3.54	−63	1,153	42.67	.117	1.94

TABLE 58.—*Depth of evaporation from ground surface near Independence, tank set No. 7.*

Month.	Volume of water supplied reservoir tank (gallons).	Depth of water in reservoir tank (feet).		Accumulation or depletion of water in reservoir tank (gallons).	Volume of water evaporated.			Average depth to ground-water surface in soil tank (feet).
		Beginning of month.	End of month.		Total (gallons).	Depth (inches).	Rate in inches per 24 hours.	
1910.								
June	139	5.62	5.50	− 4	143	5.30	0.177	1.47
July	166	5.50	5.91	+13	153	5.67	.183	1.57
August	198	5.91	5.98	+ 2	196	7.26	.234	2.03
September	152	5.98	5.91	− 2	154	5.70	.190	1.83
October	111	5.91	6.01	+ 3	108	4.00	.129	1.70
November	50	6.01	5.79	− 7	57	2.11	.070	1.18
December	3	5.79	5.07	−23	26	.96	.031	.63
1911.								
January	3	5.07	4.70	−12	15	.56	.018	.73
February	31	4.70	5.08	+12	19	.70	.025	.81
March	67	5.08	5.90	+26	41	1.52	.049	.98
April	102	5.90	5.96	+ 2	100	3.70	.123	1.46
May	151	5.96	5.92	− 1	152	5.62	.181	1.64
Year	1,173	5.62	5.92	+ 9	1,164	43.10	.118	1.34

TABLE 59.—*Average amount of water used by several plants in Wisconsin in producing a ton of dry matter.*

Crop.	Number of trials.	Water used per ton of dry matter (tons).	Water used (inches).	Dry matter produced per acre (tons).	Acre-inches of water per ton of dry matter.
Barley	5	464.1	20.69	5.05	4.096
Oats	20	503.9	39.53	8.89	4.447
Maize	52	270.9	15.76	6.59	2.391
Clover	46	576.6	22.34	4.39	5.089
Peas	1	477.2	16.89	4.01	4.212
Potatoes	14	385.1	23.78	7.00	3.399
Average		446.3	23.16	5.99	3.939

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TABLE 60.—*Loss in weight of newly cut alfalfa, in ounces per square yard of field area.*

Period.	Sample No. 1.	Sample No. 2.	Sample No. 3.	Sample No. 4.	Average.
First 15 minutes	(4.5)	(7.0)	7.5	5.5	6.1
Second 15 minutes	(4.0)	(4.5)	5.5	4.0	4.5
Third 15 minutes	(3.5)	(3.5)	4.5	3.5	3.8
First 30 minutes	8.5	11.5	13.0	9.5	10.6
Second 30 minutes	6.0	7.5	8.5	6.0	7.0
Third 30 minutes	4.5	5.5	6.0	4.0	5.0
First hour	14.5	19.0	21.5	15.5	17.6
Second hour	10.5	10.5	11.7	6.5	.....

TABLE 61.—*Percolation from precipitation upon intermediate mountain slopes of Independence region.*

[Mean seasonal values.]

Adjacent high mountain drainage area.	Depth of precipitation on center of area (inches).[a]			Volume of precipitation on area (acre-feet).	Percolation factor.	Amount of percolation.	
	A.	B.	Average.			Volume in acre-feet.	Discharge in second-feet.
Tabooce group of precipitation gages.							
Tinemaha	22.2	17.8	20.0	2,320	0.75	1,740	2.4
Red Mountain	23.6	17.8	20.7	2,620	.75	1,970	2.7
Tabooce	22.2	16.5	19.4	4,080	.75	3,060	4.2
Goodale	18.5	20.0	19.2	2,350	.75	1,760	2.4
Division	19.9	15.5	17.7	900	.70	630	.9
	.....	.....	.....	12,270	.....	9,160	12.6
Oak group of precipitation gages							
Sawmill	18.2	13.4	18.3	1,290	0.70	900	1.2
Thibaut, North Fork	18.2	18.9	18.6	530	.70	370	.5
Thibaut, South Fork	14.5	15.0	14.8	60	.60	40	.1
Oak, North Fork	16.4	14.2	15.3	2,950	.60	1,770	2.4
Oak, South Fork	16.4	15.8	16.1	880	.70	620	.9
Little Pine	17.7	15.8	16.8	1,810	.70	1,270	1.8
Pinyon	18.7	20.8	19.8	3,050	.75	2,290	3.2
	.....	.....	.....	10,570	.....	7,260	10.1
Bairs group of precipitation gages.							
Symmes	13.4	17.0	15.2	340	0.70	240	0.3
Shepard	12.7	12.4	12.6	650	.65	420	.6
Bairs, North Fork	12.4	10.8	11.6	300	.65	200	.3
Bairs, South Fork	14.8	12.0	13.4	860	.70	600	.8
George	15.8	15.8	15.8	1,760	.70	1,230	1.7
Hogback	15.2	13.6	14.4	830	.70	580	.8
	.....	.....	.....	4,740	.....	3,270	4.5
Grand total	.....	.....	.....	27,580	.....	19,690	27.2

[a] Depth of precipitation as obtained by the precipitation-altitude diagram is given under A; as obtained by the precipitation-distance diagram, under B. The average is taken for use in computations.

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TABLE 62.—*Percolation from precipitation upon outwash slopes of the Independence region.*

[Mean seasonal values.]

Contours bounding precipitation zones.	Area of zones (square miles).	Depth of precipitation (inches).		Volume of precipitation on zone (acre-feet).	Percolation factor.	Amount of percolation.	
		On contours.	On zone.			Volume in acre-feet.	Discharge in second-feet.
Taboose group of precipitation gages.							
Grass–4,500	28.07	6.0, 7.7	6.8	10,180	0.00	0	0
4,500–5,000	8.54	7.7, 9.0	8.4	3,830	.10	380	.5
5,000–5,500	8.14	9.0, 10.8	9.9	4,300	.20	860	1.2
5,500–6,000	5.56	10.8, 12.9	11.8	3,500	.35	1,220	1.7
6,000–6,500	3.42	12.9, 15.2	14.0	2,550	.60	1,530	2.1
	53.73	.....	.....	24,360	.....	3,990	5.5
Oak group of precipitation gages.							
Grass–4,500	24.57	4.8, 5.9	5.4	7,080	0	0	0
4,500–5,000	11.78	5.9, 7.3	6.6	4,150	.05	210	.3
5,000–5,500	9.23	7.3, 9.1	8.2	4,040	.15	610	.8
5,500–6,000	5.82	9.1, 11.3	10.2	3,170	.30	950	1.3
6,000–6,500	4.82	11.3, 13.6	12.4	3,190	.50	1,600	2.2
	56.22	.....	.....	21,630	.....	3,370	4.6
Bairs group of precipitation gages.							
Grass–4,500	19.56	3.3, 4.0	3.6	3,760	0	0	0
4,500–5,000	11.68	4.0, 5.2	4.6	2,860	0	0	0
5,000–5,500	9.76	5.2, 6.9	6.0	3,120	.10	310	.4
5,500–6,000	9.23	6.9, 8.6	7.8	3,840	.25	960	1.3
6,000–6,500	5.11	8.6, 10.3	9.4	2,560	.45	1,150	1.6
	55.34	.....	.....	16,140	.....	2,420	3.3
Grand total	165.29	.....	.....	62,130	.....	9,780	13.4

TABLE 63.—*Estimated net volume of water used for irrigation in the Independence region during the year 1909.*

Source of supply.	Area irrigated (acres).[a]	Duty of water per acre for season (acre-feet).[b]	Total volume of water used.	
			Acre-feet.	Second-feet for 6 months.
Taboose Creek	(170)	(12)	2,040	5.6
Goodale Creek	(110)	(16)	1,760	4.9
Division Creek	(80)	(16)	1,280	3.5
Sawmill Creek	(90)	(16)	1,440	4.0
Oak Creek, ranch No. 1	109	7.22	790	2.2
Oak Creek, ranch No. 2	49	15.40	758	2.1
Oak Creek, ranch No. 3	155	2.80	435	1.2
Oak Creek, ranch No. 4	260	2.34	609	1.7
Oak Creek, ranch No. 5	38	16.40	623	1.7
Oak Creek	(80)	(16)	1,280	3.5
Do	(100)	(5)	500	1.4
Do	(560)	(3)	1,680	4.6
Little Pine Creek	(300)	(14)	4,200	11.6
Symmes Creek	(100)	(5)	800	2.2
Shepard Creek	(280)	(12)	3,360	9.3
George Creek	(160)	(12)	1,920	5.3
Stevens ditch	(310)	(8)	2,480	6.9
	3,011	.....	25,955	71.7

[a] Areas in parentheses obtained from approximate field observations; other areas obtained by careful field measurement.

[b] Figures in parentheses assumed from observations on Oak Creek ranches.

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TABLE 64.—*Statistics of observation wells in the Independence region.*

Well No.	Location.			Class of well	Depth of well (feet).	Elevation of ground surface (feet).	Elevation of bench mark (feet).	Description of surface conditions.
	T.	R.	Sec.					
A-4	11 S.	34 E.	23	2-inch test hole	7.5	3,850.8	3,850.85	Rabbit brush and bunch salt grass, sandy, no alkali.
A-3	11 S.	34 E.	23	do	7.5	3,843.6	3,843.65	Same as A-4, but surface drier, as there is no irrigation seepage.
A-2	11 S.	34 E.	23	do	6.0	3,835.0	3,835.01	Same as A-4, salt and tule grass, light soil, trace of alkali.
A-2A	11 S.	34 E.	23	do	6.0	3,830.9	3,830.91	Same as A-2, heavier growth of grass.
A-2B	11 S.	34 E.	14	do	7.0	3,824.0	3,823.98	Tule grass, heavy black soil, trace of alkali.
22	11 S.	34 E.	25	do	9.5	3,827.4	3,827.35	Salt grass and little rabbit brush, black soil, trace of alkali.
D-4	11 S.	34 E.	35	do	7.5	3,831.7	3,831.73	Rabbit brush and scattering salt grass, sandy, no alkali.
D-3	11 S.	34 E.	35	do	7.5	3,822.4	3,822.42	Rabbit brush and bunch salt grass, clay soil, white alkali film.
D-2	11 S.	34 E.	36	do	6.5	3,821.6	3,821.28	Scattering bunch grass, clay soil, alkali at grass roots.
D-1	11 S.	34 E.	25	10-foot diameter dug well	8.0	3,817.6	3,817.65	Elevation west of fault, 3,826.8 feet; salt and tule grass; soil alkali crust.
21	12 S.	34 E.	2	2-inch test hole in pit	7.5	3,813.6	3,813.45	Luxuriant salt grass, surface soil puffed with alkali.
20	12 S.	34 E.	2	do	7.5	3,814.3	3,814.77	Scattering salt grass and rabbit brush, clay soil, no alkali.
18	11 S.	34 E.	36	2-inch test hole	6.0	3,816.4	3,816.30	Do.
19	11 S.	34 E.	36	2-inch test hole in pit	5.0	3,819.6	3,818.60	Do.
B-2	12 S.	34 E.	11	2-inch test hole	9.5	3,820.5	3,820.46	Sagebrush and bunch salt grass, clay soil, no alkali.
B-3	12 S.	34 E.	11	do	7.0	3,809.9	3,809.87	Luxuriant salt grass, light soil, trace of alkali.
B-4	12 S.	34 E.	1	do	7.5	3,807.0	3,807.04	Scattering salt grass and sagebrush, clay soil, trace of alkali.
B-5	12 S.	34 E.	1	do	6.0	.....	.....	Luxuriant bunch salt grass, sandy, thick alkali crust.
B-6	12 S.	34 E.	1	do	7.5	.....	.....	Salt and tule grass, sandy, alkali crust.
B-6A	12 S.	34 E.	1	do	7.5	.....	.....	Do.
59	12 S.	34 E.	16	5-foot diameter dug well	25.8	3,869.2	3,869.20	Good growth of sagebrush, desert sand, no alkali.
24	12 S.	34 E.	14	2-inch test hole in pit	4.0	3,811.1	3,811.10	Scattering salt grass, sandy surface, white alkali spots.
24A	12 S.	34 E.	14	2-inch test hole	5.5	3,815.1	3,815.14	Salt grass in mounds, hog-wallow surface, alkali crust.
45	12 S.	34 E.	11	3 by 3 foot dug well	11.5	3,821.5	3,823.33	Sagebrush, desert sand, no alkali.
SM-1	12 S.	34 E.	15	2-inch test hole	7.5	3,842.3	3,842.32	Meadow grass, clay soil, no alkali.
SM-3	12 S.	34 E.	14	do	7.5	3,822.7	3,822.70	Same as SM-1, trace of alkali.
SM-4	12 S.	34 E.	14	do	5.5	3,806.7	3,806.67	Scattering salt grass, sandy, no alkali.
T-1	12 S.	34 E.	22	do	9.5	3,836.8	3,836.75	Bunch salt grass and rabbit brush, sandy, trace of alkali.
T-2	12 S.	34 E.	23	do	7.5	3,813.1	3,813.11	Luxuriant salt grass and sunflowers, black soil, no alkali.
T-3	12 S.	34 E.	23	do	5.0	3,801.4	3,801.37	Scattering salt grass, clay, alkali in spots.
T-4	12 S.	34 E.	23	do	7.0	3,800.4	3,801.66	Do.
T-5	12 S.	34 E.	13	do	7.5	.....	.....	Luxuriant meadow grass, black soil, no alkali.
T-6	12 S.	34 E.	13	do	6.0	3,796.8	3,796.84	Salt grass and sagebrush on mounds, hog-wallow surface, alkali spots.
T-7	12 S.	35 E.	18	do	9.5	3,794.4	3,794.42	Luxuriant salt grass, clay soil, spots of alkali.
T-8	12 S.	35 E.	18	do	6.0	3,797.4	3,797.41	Scattering salt grass, sandy, alkali in spots.
26	12 S.	34 E.	26	6-inch casing well	18.0	3,849.4	3,851.75	Good growth of sagebrush, desert sand, no alkali.
25	12 S.	34 E.	26	do	19.0	3,847.0	3,848.75	Do.
17	12 S.	34 E.	23	2-inch test hole in pit	8.0	3,811.1	3,809.44	Salt grass, sandy soil, no alkali.
16	12 S.	34 E.	26	do	12.5	3,809.8	3,808.00	Salt grass, gravelly soil, no alkali.
15	12 S.	34 E.	26	2-inch test hole	6.0	(3,806.4)	(3,806.4)	Salt grass, clay, no alkali.
56	12 S.	34 E.	26	do	7.5	3,795.2	3,795.17	Scattering grass, clay, alkali crust.

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TABLE 64.—*Statistics of observation wells in the Independence region*—Continued.

Well No.	Location. T.	Location. R.	Location. Sec.	Class of well.	Depth of well (feet).	Elevation of ground surface (feet).	Elevation of bench mark (feet).	Description of surface conditions.
GL-1	12 S.	34 E.	35	4-foot diameter dug well	12.3	3,884.9	3,885.01	Upper edge of meadow.
GL-1A	12 S.	34 E.	35	do	13.5	3,882.3	3,882.85	Do.
GL-2	12 S.	34 E.	35	2-inch test hole	7.5	3,834.3	3,834.34	Tule grass and sunflowers, black soil, no alkali.
GL-3	12 S.	34 E.	35	2-inch test hole in pit	7.0	3,804.6	3,803.75	Salt grass, light soil, no alkali.
GL-4	12 S.	34 E.	25	2-inch test hole	6.0	3,788.8	3,788.79	Luxuriant salt and tule grass, clay, no alkali.
GL-5	12 S.	34 E.	25	do	4.5	3,792.2	3,792.19	Salt grass, black soil, alkali deposit.
GL-6	12 S.	35 E.	30	do	9.5	3,792.5	3,792.54	Salt grass and sagebrush, mounds, hog-wallow surface, alkali crust
GL-7	12 S.	35 E.	30	do	7.5	3,791.8	3,791.76	Same as GL-6, less alkali.
GL-8	12 S.	35 E.	19	do	4.0	3,781.4	3,781.41	Luxuriant salt grass, black soil, alkali at grass roots.
GL-9	12 S.	35 E.	19	do	6.0	3,783.4	3,783.41	Do.
GL-10	12 S.	35 E.	19	do	7.0	3,784.1	3,784.11	Do.
GL-11	12 S.	35 E.	19	do	7.5	3,785.1	3,785.06	Salt grass, light soil, spots of alkali.
GL-12	12 S.	35 E.	19	do	7.5	3,786.4	3,786.36	Do.
GL-13	12 S.	35 E.	19	do	7.5	3,786.4	3,786.41	Do.
GL-14	12 S.	35 E.	29	do	5.5	3,786.8	3,786.76	Same as GL-11, west of fault.
GL-14A	12 S.	35 E.	29	do	7.5	3,786.3	3,786.26	Same as GL-11, east of fault.
GL-15	12 S.	35 E.	29	do	7.5	3,789.8	3,789.76	Same as GL-11, some sagebrush.
57	12 S.	34 E.	36	2-inch test hole in pit	7.0	.....	.....	Luxuriant salt grass, little rabbit brush, no alkali.
55	12 S.	34 E.	36	2-inch test hole	9.0	.....	.....	Salt grass and rabbit brush, soil puffed with alkali.
54	12 S.	35 E.	.....	do	8.5	.....	.....	Luxuriant salt grass, clay soil, little alkali.
O-8	13 S.	35 E.	5	do	9.5	3,812.6	3,812.50	Luxuriant salt grass and sunflowers, clay soil, no alkali.
O-7	13 S.	35 E.	5	do	9.5	3,803.5	3,803.54	Do.
O-9	13 S.	35 E.	5	.....	8.5	3,796.4	3,796.40	Luxuriant salt grass, sandy soil, trace of alkali.
O-6	13 S.	35 E.	5	2-inch test hole	7.5	3,788.8	3,788.66	Salt grass, clay soil, no alkali.
O-5	13 S.	35 E.	5	do	9.5	3,788.1	3,787.89	Luxuriant grass and sunflowers, clay soil, no alkali.
O-4	12 S.	35 E.	32	.....	9.0	3,784.2	3,783.74	Scattering salt grass and a few sunflowers, sandy, clay, little alkali.
O-3A	12 S.	35 E.	32	2-inch test hole	6.0	3,776.3	3,776.31	Short salt grass, sandy, little alkali.
O-3	12 S.	35 E.	32	do	6.0	3,773.4	3,773.35	Elevation west of fault, 3,782.2 feet; surface same as O-3A.
O-2	12 S.	35 E.	33	do	7.5	3,772.3	3,772.27	Little sagebrush on mounds, bare hog-wallow land, thick alkali crust.
63	13 S.	34 E.	1	3-foot diameter dug well	23.0	3,947.9	3,947.92	Bare sandy black soil, irrigated land south and east.
53	13 S.	35 E.	5	2-inch test hole	9.0	.....	.....	Luxuriant salt grass, light clay soil puffed with alkali.
52	13 S.	35 E.	5	do	7.5	3,803.1	3,803.10	Luxuriant salt grass and little rabbit brush, deep soil, no alkali.
51	13 S.	35 E.	5	.....	7.5	3,787.7	3,787.70	Rabbit brush and luxuriant salt grass, light soil, no alkali.
50	13 S.	35 E.	4	2-inch test hole	9.5	3,782.7	3,782.70	Luxuriant salt grass, clay soil puffed with alkali.
49	13 S.	35 E.	3	do	3.5	3,766.2	3,766.20	Sagebrush on mounds, bare hog-wallow land, alkali crust.
U-1	13 S.	35 E.	8	do	7.5	3,866.3	3,865.67	Salt grass and rabbit brush, gravelly soil, alkali at roots.
U-1A	13 S.	35 E.	8	do	7.0	3,866.3	.....	Do.
U-2	13 S.	35 E.	8	do	6.5	3,827.6	3,827.16	Same as U-1, sandy soil.
U-3	13 S.	35 E.	9	do	7.0	3,802.5	3,802.53	Same as U-1, clay soil.
U-4	13 S.	35 E.	4	do	11.5	3,779.0	3,779.00	Salt grass, light clay soil puffed with alkali.
U-5	13 S.	35 E.	3	do	7.5	3,775.1	3,775.10	Rabbit brush and scattering salt grass, light clay soil, little alkali.

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U-6A	13 S.	35 E.	3	.....do.....	4.0	3,768.4	3,768.40	Green tule grass, hole in face of bank.
U-6	13 S.	35 E.	3	.....do.....	7.5	3,708.0	3,708.00	Elevation west of fault, 3,772 feet; salt grass, light clay soil.
U-8	13 S.	35 E.	3	.....do.....	7.5	3,700.7	3,700.70	Sagebrush on mounds, bare hog-wallow land, alkali in spots.
U-7	13 S.	35 E.	3	.....do.....	6.5	3,759.5	3,759.50	Tule grass in bunches, sandy, no alkali.
62	13 S.	35 E.	17	6-foot diameter dug well.....	30.0	3,922.5	3,922.46	Irrigated garden, formerly sand and sagebrush, sandy black soil.
61	13 S.	35 E.	17	4-foot diameter dug well.....	53.0	3,940.2	3,940.18	Do.
64	13 S.	35 E.	7	4 by 4 foot dug well.....	26.5	3,902.4	3,902.38	Sagebrush, gravel and sand.
35	13 S.	35 E.	9	2-inch test hole.....	5.5	3,831.5	3,831.47	Luxuriant grass, gravelly soil, no alkali.
30	13 S.	35 E.	10	4-inch casing well.....	18.3	3,787.1	3,787.77	Salt grass and rabbit brush, clay soil, no alkali.
36	13 S.	35 E.	9	2-inch test hole.....	7.5	3,779.1	3,779.08	Salt grass, clay soil, no alkali.
48	13 S.	35 E.	3	.....do.....	9.5	3,778.2	3,779.14	Salt grass, dark clay soil puffed with alkali.
I-2	13 S.	35 E.	16	.....do.....	9.5	3,849.6	3,849.60	Salt grass, tule grass and willows, sandy soil, no alkali.
I-3	13 S.	35 E.	16	.....do.....	3.5	3,836.7	3,836.70	Luxuriant salt and tule grass, black soil, little alkali.
I-4	13 S.	35 E.	16	.....do.....	7.5	3,809.4	3,809.40	Scattering salt grass, clay soil, alkali at roots.
I-5	13 S.	35 E.	16	.....do.....	6.0	3,792.0	3,791.48	Rank growth bunch grass, rabbit brush, clay soil, little alkali.
I-6	13 S.	35 E.	15	2 by 4 foot hole.....	3.0	3,774.3	3,773.60	Short salt grass, black soil, no alkali.
I-6A	13 S.	35 E.	15	2-inch test hole.....	9.0	3,775.3	3,775.22	Salt grass, sandy soil, little alkali.
I-6B	13 S.	35 E.	15	4-inch casing well.....	6.0	3,775.2	3,776.93	Do.
I-7	13 S.	35 E.	10	2-inch test hole.....	8.0	3,764.8	3,764.35	Bunch salt grass, bare sandy soil, no alkali.
31	13 S.	35 E.	21	6-inch casing well.....	25.0	3,875.3	3,876.06	Sagebrush, desert sand, no alkali.
1	13 S.	35 E.	21	4 by 4 foot well.....	7.0	3,837.5	3,839.18	Luxuriant salt grass, black soil, no alkali.
2	13 S.	35 E.	16	2-inch test hole.....	7.5	3,803.9	3,803.90	Bunch salt grass, light soil, little alkali.
14	13 S.	35 E.	15	6-foot diameter dug well.....	7.5	3,812.3	3,812.82	Salt grass, sandy soil, alkali at grass roots.
37	13 S.	35 E.	15	2-inch test hole.....	6.5	3,766.4	3,766.48	Salt grass, sagebrush, clay soil puffed with alkali.
37A	13 S.	35 E.	15	.....do.....	5.0	3,766.4	.....	Do.
C-1	13 S.	35 E.	21	4 by 4 foot dug well.....	27.7	3,889.6	3,890.41	Sagebrush, desert sand, no alkali.
C-3	13 S.	35 E.	22	2-inch test hole.....	6.0	3,812.9	3,812.94	Luxuriant salt grass, sandy soil, a little alkali.
C-4	13 S.	35 E.	22	3 by 5 foot pit.....	5.5	3,804.3	3,801.87	Luxuriant salt grass, clay soil, alkali crust in spots.
C-5A	13 S.	35 E.	22	2-inch test hole.....	6.5	3,779.8	3,779.85	Salt grass, clay soil, little alkali.
C-6	13 S.	35 E.	15	.....do.....	7.5	3,765.7	3,765.72	Bunch salt grass, clay soil, alkali crust.
C-6A	13 S.	35 E.	22	.....do.....	6.5	3,766.2	3,766.15	Do.
C-7	13 S.	35 E.	14	.....do.....	6.5	3,762.1	3,761.92	Scattering salt grass and sagebrush, light clay soil, alkali crust.
C-8	13 S.	35 E.	14	.....do.....	8.0	.....	.....	Sagebrush, sandy soil, no alkali.
28	13 S.	35 E.	21	6-inch casing well.....	26.3	3,869.0	3,870.33	Scattering salt grass and rabbit brush, desert sand, no alkali.
28A	13 S.	35 E.	21	5 by 5 foot dug well.....	15.0	3,869.1	3,871.01	Do.
13A	13 S.	35 E.	27	2-inch test hole.....	7.5	3,842.6	3,842.64	Scattering salt grass, sagebrush, desert sand, no alkali.
4	13 S.	35 E.	27	.....do.....	6.0	3,803.3	3,803.31	Scattering salt grass, sandy soil, no alkali.
5	13 S.	35 E.	22	3 by 6 foot test hole.....	6.5	3,802.6	3,799.55	Salt grass, black soil, little alkali.
32	13 S.	35 E.	23	4 by 4 foot dug well.....	7.0	3,765.0	3,765.02	Salt grass and sagebrush, clay soil, little alkali.
38	13 S.	35 E.	23	2-inch test hole.....	7.5	3,765.4	3,765.15	Salt grass, clay soil, little alkali.
L-6	13 S.	35 E.	27	.....do.....	9.5	3,848.2	3,848.24	Scattering salt grass and sage and rabbit brush, light clay soil, no alkali.
L-5	13 S.	35 E.	27	.....do.....	7.5	3,810.3	3,810.74	Salt grass, sunflowers, and rosebushes, clay soil, no alkali.
L-4	13 S.	35 E.	27	3 by 6 foot test pit.....	5.5	3,799.0	3,798.90	Luxuriant salt grass, clay soil, alkali at grass roots, and surface caked.
L-3	13 S.	35 E.	27	2-inch test hole.....	4.5	3,768.4	3,768.03	Scattering salt grass, clay soil, no alkali.
L-2	13 S.	35 E.	26	.....do.....	7.2	3,757.0	3,757.03	Scattering salt grass, sagebrush, sandy soil, little alkali.
L-1	13 S.	35 E.	26	.....do.....	5.0	3,741.6	3,741.59	Elevation west of fault, 3,752.5 feet; scattering salt grass, little alkali.
7	13 S.	35 E.	34	3 by 6 foot test pit.....	5.0	3,796.5	3,795.50	Luxuriant salt grass, clay soil, alkali crust.
6	13 S.	35 E.	34	.....do.....	6.0	3,800.3	3,797.60	Do.
46	13 S.	35 E.	34	2-inch test hole.....	7.0	3,772.4	(3,772.4)	Luxuriant salt grass, rosebushes, black soil, no alkali.
40	13 S.	35 E.	35	.....do.....	7.5	3,772.8	(3,772.8)	Salt grass, clay soil puffed with alkali.
39	13 S.	35 E.	26	.....do.....	7.0	3,759.7	(3,759.7)	Salt and tule grass, clay soil, little alkali.

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TABLE 64.—*Statistics of observation wells in the Independence region*—Continued.

Well No.	Location.			Class of well.	Depth of well (feet).	Elevation of ground surface (feet).	Elevation of bench mark (feet).	Description of surface conditions.
	T.	R.	Sec.					
39A	13 S.	35 E.	26	2-inch test hole	7.0	3,760.0	(3,759.9)	Salt grass, clay soil puffed with alkali.
S-2	14 S.	35 E.	3	3 by 6 foot pit	6.0	3,797.8	3,797.69	Luxuriant salt grass, alkali crust.
S-3	13 S.	35 E.	35	2-inch test hole	3.5	3,769.8	3,769.80	Luxuriant salt grass, black soil, alkali crust.
S-4	13 S.	35 E.	35	.....do	7.0	3,759.1	3,759.14	Same as S-3, sandy soil.
S-5	13 S.	35 E.	35	.....do	7.5	3,743.2	3,743.24	Scattering salt grass, light soil, alkali crust.
S-6	13 S.	35 E.	36	3-inch cast-iron pipe, 4 by 4 foot well.	19.3	3,740.5	3,737.05	Same as S-5, no alkali.
S-7	13 S.	35 E.	36	2-inch test hole	6.0	.....	.....	Luxuriant tule grass, black soil, no alkali.
47	14 S.	35 E.	1	.....do	5.5	3,745.2	3,745.16	Scattering salt grass and rabbit brush, sandy soil, alkali crust.
C-3	14 S.	35 E.	11	5-foot diameter dug well	14.3	3,791.6	3,790.26	Sage and rabbit brush, desert sand, no alkali.
C-4	14 S.	35 E.	1	2-inch test hole	9.5	3,760.1	3,760.10	Little sagebrush and bunch salt grass, light clay soil, little alkali.
C-5	14 S.	35 E.	1	.....do	8.0	3,731.8	3,731.77	Little salt grass and sagebrush, sandy soil, no alkali.
29	14 S.	35 E.	15	4 by 4 foot dug well	19.5	3,868.2	3,870.38	Sagebrush and desert sand, irrigation near by.
9	14 S.	35 E.	11	2-inch test hole in pit	12.0	3,796.6	3,788.40	Large sagebrush, desert sand, no alkali.
8	14 S.	35 E.	11	.....do	9.5	3,795.3	3,792.16	Bunch salt grass, sandy soil, no alkali.
W-7	14 S.	35 E.	14	2-inch test hole	7.0	3,821.6	3,821.55	General elevation 400 feet north, 3,826 feet; luxuriant grass, black soil, alkali spots.
W-6	14 S.	35 E.	14	3 by 6 foot pit	5.0	3,794.4	3,793.88	Salt grass and sagebrush, sandy soil, a little alkali.
W-5	14 S.	35 E.	14	2-inch test hole	6.2	3,780.4	3,779.00	Scattering salt grass, sandy soil, no alkali.
W-4	14 S.	35 E.	12	.....do	7.0	3,755.2	3,755.20	Scattering salt grass and sagebrush, sandy soil, little alkali.
W-3H	14 S.	35 E.	12	.....do	4.0	3,747.1	3,747.10	Bunch salt grass, sandy soil, alkali crust.
W-3B	14 S.	35 E.	12	.....do	3.0	3,743.8	3,743.84	Tule grass, black soil, no alkali.
W-3C	14 S.	35 E.	12	.....do	3.5	3,742.6	3,742.55	Do.
W-3A	14 S.	35 E.	12	.....do	3.5	3,740.5	3,740.53	Do.
W-3D	14 S.	35 E.	12	.....do	3.5	3,736.8	3,736.77	Do.
W-3	14 S.	35 E.	12	.....do	5.0	3,735.8	3,735.78	Do.
W-3E	14 S.	35 E.	12	.....do	3.0	3,735.5	3,735.53	East edge of tule grass at sand.
W-3F	14 S.	35 E.	12	.....do	5.5	3,736.3	3,736.26	Sand, very little vegetation.
W-3G	14 S.	35 E.	12	.....do	3.0	3,736.4	3,736.45	Tule grass, black soil, no alkali.
W-2	14 S.	35 E.	12	.....do	9.5	3,722.7	3,722.71	Salt grass, clay soil, no alkali.
43	14 S.	35 E.	14	6 by 6 foot dug well	9.0	3,862.0	3,862.13	Scattering salt grass and rabbit brush, sandy soil, no alkali.
33	14 S.	35 E.	14	3 by 3 foot dug well	5.0	3,834.7	3,834.66	Tule and salt grass, black soil, no alkali.
10A	14 S.	35 E.	14	2-inch test hole	7.5	3,795.5	3,795.47	Scattered salt grass, sage and rabbit brush, sandy soil, little alkali.
11A	14 S.	35 E.	24	.....do	7.0	3,789.0	3,789.02	Do.
12	14 S.	35 E.	24	2.5-foot dug well	12.0	3,796.8	3,799.07	Luxuriant salt grass, no alkali.
34	14 S.	35 E.	13	4-foot dug well	11.0	3,757.6	3,759.90	Elevation west of fault, 3,767.2 feet; bare coarse sand, alkali crust.
41	14 S.	35 E.	13	2-inch test hole	4.0	.....	.....	Salt grass, light soil, thick alkali crust.
G-3	14 S.	35 E.	24	.....do	7.5	3,767.6	3,767.23	Bunch salt grass and sagebrush, sandy soil, no alkali.
G-4	14 S	36 E.	19	.....do	7.0	3,728.3	3,728.26	Luxuriant salt grass, sandy soil, little alkali.
G-5	14 S.	36 E.	19	4 by 4 foot dug well	6.5	3,698.3	3,701.91	Salt grass, little alkali.
G-6	14 S.	36 E.	19	2-inch test hole	7.0	3,693.6	3,692.48	Sagebrush and salt grass on mounds, hog-wallow land, alkali crust.

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TABLE 65.—*Maximum and minimum ground-water levels in observation wells of the valley floor.*

No. of well.	1908		1909				Amount of fluctuation.		
	Lowest level.		Highest level.		Lowest level.				
	Date.	Depth below ground.	Date.	Depth below ground.	Date.	Depth below ground.	1908 minimum to 1909 maximum.	1909 maximum to 1909 minimum.	Assumed average.
A-4	Sept. 1	7.4			Oct. 19	6.0			4.0
A-3	Oct. 2	5.8	Mar. 10	4.9			0.9	2.5	2.0
A-2A	Aug. —	(4.5)	Mar. 30	1.1	Aug. 26	3.5	(3.4)	2.4	2.9
A-2	Aug. —	(5.2)	Jan. 22	2.3	July 21	4.5	(3.0)	2.2	2.6
22	Oct. 2	8.9	Mar. 30	.8			8.1		6.0
D-4	Aug. —	(7.0)					2.1		2.0
D-3	(Sept. 1)	(5.2)	Jan. 22	2.0	Aug. 27	5.1	(3.2)	3.1	3.2
D-2	(Sept. 1)	(4.1)	Mar. —	(2.4)	Aug. 26	3.9	(1.7)	(1.5)	2.0
D-1	(Sept. 1)	(2.0)	Jan. 22	.6	Sept. 21	1.8	(1.4)	1.2	1.0
21	Sept. 7	7.3	Mar. 11	3.4			3.9		4.0
20	Aug. —	(5.7)	Mar. 10	2.6			(3.1)		3.1
18	Oct. 24	4.3	Mar. —	(2.3)	(Sept. —)	4.2	(2.0)	(1.9)	2.0
19	Sept. 7	6.2	Mar. 11	3.3	Sept. 22	5.1	2.9	1.8	2.2
B-2	Oct. 24	8.7	Mar. 3	(6.0)	Aug. 26	8.6	(2.7)	(2.6)	2.7
B-3	Oct. 24	6.2	Mar. 1	0.9			5.3		5.3
B-4	Sept. 16	5.3	Mar. 10	2.2	Sept. 22	5.6	3.1	3.4	3.2
B-6	Aug. —	(3.0)	Mar. 10	1.4	Aug. 27	3.4	(1.6)	2.0	1.8
B-6A			Dec. 8, '08–Mar. 10, '09	.4	Aug. 27	3.8		3.4	3.4
45			Mar. 7	7.4	Sept. 21	9.3		1.9	2.0
SM-1	Aug. —	(6.5)	Jan. 23	2.6	June 20	4.3	(3.9)	1.7	2.8
SM-3		(5.5)	Mar. 3	.7	Aug. 26	4.4	(4.8)	3.7	4.2
SM-4	Sept. 1	3.2			July 22	3.4			2.5
T-1	Nov. 10	9.7	Apr. 20	6.4	Oct. 20	9.6	3.3	3.2	3.2
T-2	Oct. 4	6.9	Mar. 29	1.1	Sept. 21	6.8	5.8	5.7	5.8
T-3	Oct. 4	4.1	Mar. 28	1.8	Sept. 21	3.9	2.3	2.1	2.2
T-4			Oct. 4, '08–Apr. 1, '09	1.1	May 25	2.6		1.5	1.5
T-6	Aug. —	(5.0)	Mar. 10	1.0	July 21	4.4	(4.0)	3.4	3.7
T-7	Sept. —	7.3	(Mar. 30)	(1.0)	Aug. 27	6.7	6.3	5.7	6.0
T-8			Feb. 27	.6	Oct. 19	5.8		5.2	5.2
17	Sept. 1	8.3							4.0
16	Aug. —	(12.5)	Mar. 29	6.3				6.2	6.0
15			Dec. 7, '08	2.6	Aug. 26	6.4		3.8	3.8
56			Mar. 29	2.5	Sept. 21	6.6		4.1	4.1
GL-1	Aug. 31	9.7	Mar. 29	8.0	May 28	8.5	1.7	.5	1.1
GL-1A	Aug. 31	7.2	Mar. 8	5.6	May 28	6.0	1.6	.4	
GL-2	Aug. —	(6.1)	Nov. 7, '08–Mar. 29, '09	1.7	Sept. 21	7.4	4.4	5.7	5.0
GL-3	Aug. —	(8.5)	Mar. 28	1.8	Oct. 20	7.8	(6.7)	6.0	6.4
GL-4	Aug. 31	5.1	Mar. 8	.2	Sept. 21	6.0	4.9	5.8	5.4
GL-6	Nov. 9	9.3	Apr. 21	5.7	Oct. 18	8.6	3.6	2.9	3.2
GL-7	Dec. 8	6.6	(Apr. 21)	(2.5)	Oct. 18	6.5	4.1	4.0	4.0
Goose Lake	Oct. 24	2.0	Apr. 24	+.3	Oct. 18	2.2	2.3	2.5	2.4
GL-8	Sept. 1	1.1	Jan. 1–June 26.	(a)	Sept. 22	1.7			
GL-9	(Sept. 1)	(3.5)	Apr. 21	.7	Sept. 22	3.9	(2.8)	3.2	3.0
GL-10	(Sept. 1)	(4.3)	Apr. 21	1.2	Sept. 22	4.2	(3.1)	3.0	3.0
GL-11	Sept. 1	4.3	Mar. 30	1.8	July 21	4.2	2.5	2.4	2.4
GL-12	(Sept. 1)	(5.8)	Apr. 21	2.8	Aug. 27	5.6	(3.0)	2.8	2.9
GL-13	(Sept. 1)	(5.3)	Apr. 21	2.6	Sept. 22	5.2	(2.7)	2.6	2.6
GL-14	(Sept. 1)	(4.8)	Apr. 21	2.6	Sept. 22	4.5	(2.2)	1.9	2.0
GL-14A	Sept. 1	(5.0)	Apr. 21	2.6	Sept. 22	5.0	(2.4)	2.4	2.4
GL-15			Apr. 21	5.9	Sept. 22	7.6		1.7	1.7
57			Mar. 29	3.2	Oct. 20	6.2		3.0	3.0
55			Apr. 20	3.3	Sept. 21	6.4		3.1	3.1
O-8	Sept. —	(8.0)	Mar. 29	2.3	Sept. 21	6.2	(5.7)	3.9	4.8
O-7	Sept. —	(9.3)	Mar. 25	2.9	Oct. 16	7.4	6.4	4.5	5.4
O-9	Sept. —	(8.0)	Apr. 24	5.9	Sept. 21	7.8	(2.1)	1.9	2.0
O-6	Aug. —	(7.0)	Apr. 20	3.0	Aug. 25	5.1	(4.0)	2.1	3.0
O-5	Sept. —	(9.4)	Mar. 8	2.7	Oct. 16	9.9	6.7	7.2	7.0
O-4	Oct. 1	8.4	Mar. 29	5.5	Oct. 16	8.2	2.9	2.7	2.8
O-3A	Oct. 24	4.2	Mar. 25	2.4	Oct. 16	4.0	1.8	1.6	1.7
O-3	Oct. 1	3.2	Mar. 8–Apr. 20	1.4	Sept. 22	3.2	1.8	1.8	1.8
O-2	Oct. 25	5.0	Mar. 6	3.6	Oct. 16	5.2	1.4	1.6	1.5

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TABLE 65.—*Maximum and minimum ground-water levels in observation wells of the valley floor*—Continued.

No. of well.	1908		1909				Amount of fluctuation.		
	Lowest level.		Highest level.		Lowest level.				
	Date.	Depth below ground.	Date.	Depth below ground.	Date.	Depth below ground.	1908 minimum to 1909 maximum.	1909 maximum to 1909 minimum.	Assumed average.
53	.....	.....	Mar. 25	2.9	July 24	6.2	.....	3.3	3.6
52	.....	.....	Mar. 16	2.1	Oct. 16	6.4	.....	4.3	.....
50	.....	.....	Mar. 4	2.4	Oct. 16	9.6	.....	7.2	7.0
49	.....	.....	Mar. 29	1.7	Oct. 16	3.6	.....	1.9	1.9
U-1	Aug. —	(7.2)	Mar. —	(3.0)	Aug. 25	6.5	(4.2)	(3.5)	3.8
U-2	Aug. —	(4.7)	Feb. 20	.6	Sept. 13	4.6	(4.1)	4.0	4.0
U-3	Aug. —	(5.5)	Feb. 20	1.4	Sept. 13	5.0	(4.1)	3.6	3.8
U-4	.....	.....	Mar. 29	3.2	Oct. 1	5.8	.....	2.6	.....
U-5	Sept. 1-Oct. 1	4.3	Mar. 29	1.3	Aug. 25	4.7	3.0	3.4	3.2
U-6A	Sept. —	.5	Feb. 1-May 6	Flowing.	Aug. 25	1.1	.5	1.1	.8
U-6	Aug. —	(5.9)	Mar. 29	1.2	Sept. 22	7.3	4.7	6.1	5.4
U-8	.....	.....	(Mar. 12)	(3.2)	Sept. 22	5.2	.....	2.0	2.0
U-7	Dec. 8	5.4	Apr. 20	4.5	Oct. 16	6.0	.9	1.5	1.2
L-6	Sept. —	(10.0)	Jan. 1-Mar. 29	8.9	July 25	9.6	(1.1)	.7	.9
L-5	Aug. —	(4.8)	Mar. 29	.6	Aug. 16	4.8	(4.2)	4.2	4.2
L-4	Sept. 3	2.6	Feb. 16	.7	July 24	2.2	1.9	1.5	1.7
L-3	Aug. —	(4.6)	Mar. 15	2.7	Aug. 27	4.2	(1.9)	1.5	1.7
L-2	Aug. —	(4.7)	Apr. 20	2.6	Aug. 27	5.0	(2.1)	2.4	2.2
L-1	Aug. —	(4.2)	Mar. 27	.4	July 22	3.6	3.8	3.2	3.5
Lake	.....	.....	Mar. 27	.4	Sept. 8	2.6	.....	2.2	2.2
7	Sept. 1	4.1	Mar. 5	.3	July 24	3.8	3.8	3.5	3.6
6	Sept. 18	4.9	Mar. 29	2.5	Sept. 21	5.1	2.4	2.6	2.5
46	.....	.....	Feb. 16-Mar. 29	.1	Aug. 27	4.2	.....	4.1	4.1
40	.....	.....	Mar. 29	1.7	July 24	5.2	.....	3.5	3.5
39A	.....	.....	Mar. 27	2.6	Sept. 13	5.4	.....	2.8	2.8
S-2	Sept. 1	5.3	Mar. 29	1.9	Aug. 31	4.8	3.4	2.9	3.2
S-3	Aug. —	(3.0)	Jan. 30-Mar. 29	.4	Sept. 17	3.5	(2.6)	3.1	2.8
S-4	Aug. —	4.0	Mar. 29	.8	Sept. 21	3.0	3.2	2.2	2.7
S-5	Sept. —	7.4	Apr. 20	6.0	Sept. 21	8.0	1.4	2.0	1.7
47	.....	.....	Apr. 20	2.1	Oct. 17	6.2	.....	4.1	4.1
C-3	Oct. 1	14.6	Apr. 22	12.2	Sept. 21	15.2	2.4	3.0	2.7
C-4	(Sept. 1)	8.8	Apr. 28	6.6	Oct. 17	8.9	2.2	2.3	2.2
C-5	Aug. —	(7.0)	Apr. 20	4.4	Sept. 20	6.2	(2.6)	1.8	2.2
8	Aug. —	(8.7)	Mar. 29	6.2	Sept. 21	8.0	(2.2)	1.8	2.0
30	Sept. —	(4.3)	Feb. 16	.9	Sept. 20	4.5	(3.4)	3.6	3.6
36	Sept. —	(7.0)	Feb. 17	1.5	Oct. 17	5.2	(5.5)	3.7	4.3
48	.....	.....	Mar. 29	7.2	Sept. 21	8.8	.....	1.6	1.6
I-2	Aug. —	(9.0)	Mar. 6	3.9	Sept. 13	5.4	5.1	1.5	3.5
I-3	Aug. —	(3.9)	Dec. '08-Mar. 27	1.1	.....	.....	2.8	.....	2.8
I-4	Aug. —	(5.9)	Jan. 16-Feb. 16	.5	Sept. 20	5.2	5.4	4.7	5.0
I-5	Sept. 1	5.4	Mar. 27	1.7	Sept. —	5.4	3.7	3.7	3.7
I-6A	Sept. 1	(5.3)	Feb. 16	1.3	Aug. 27	4.2	4.0	2.9	3.4
I-6B	.....	.....	Mar. 27	.2	Aug. 26	3.5	.....	3.3	3.3
I-7	Oct. 1	6.2	Apr. 20	4.4	.....	.....	1.8	.....	1.8
1	Sept. 1	5.6	Feb. 16	2.0	Aug. 27	6.3	3.6	4.3	4.0
2	.....	.....	Mar. 27	.8	Sept. 12	4.1	.....	3.3	3.3
14	Sept. 14	6.5	Mar. 27	2.6	Sept. 5	(6.5)	3.9	3.9	3.9
C-3	Aug. —	5.5	Mar. 29	3.3	Sept. 21	5.7	2.2	2.4	2.3
C-4	Sept. 1	4.25	Feb. 16	1.15	Aug. 27	4.6	3.1	3.4	3.2
C-5A	Oct. 9	4.2	Mar. 13	(1.2)	Sept. 5	4.8	3.0	3.6	3.3
C-6A	Oct. 24	3.1	Feb. 16	.7	Aug. 27	3.8	2.4	3.1	2.8
13A	Aug. —	(7.5)	Mar. —	5.0	July 24	6.9	(2.5)	1.9	2.2
4	.....	.....	Mar. 29	1.9	Sept. 13	4.6	.....	2.7	2.7
5	Sept. 1	4.5	Feb. 16	2.4	Aug. 16	4.7	2.1	2.3	2.2
32	Aug. —	(5.2)	Mar. 27	2.6	Sept. 13	4.9	(2.6)	2.3	2.4
38	Sept. —	(6.3)	Apr. 20	2.3	Sept. 20	4.8	(4.0)	2.5	3.2
W-7	Sept. 6	5.6	Mar. 27	.5	.....	.....	5.1	.....	5.1
W-6	Oct. 1	4.7	Apr. 20	2.6	.....	.....	2.1	.....	2.1
W-5	Oct. 2	7.9	Mar. 6-Apr. 20	6.7	Oct. 17	7.9	1.2	1.2	1.2
W-4	.....	.....	Mar. 6	5.4	Oct. —	(8.3)	.....	2.9	2.9
W-3B	Aug. —	(3.0)	Mar. 27	.8	Sept. 20	2.9	(2.2)	2.1	2.1
43	Oct. 25	7.9	Jan. 30	4.1	Sept. 21	7.8	3.8	3.7	3.8
10A	Oct. 25	6.7	June 22	4.4	.....	.....	2.3	.....	2.3
12	Sept. 1	4.1	Mar. 6	1.3	Oct. 17	3.9	2.8	2.6	2.7
G-3	Aug. —	(7.0)	Mar. 15	4.1	Aug. 26	6.5	(2.9)	2.4	2.6
G-6	Aug. —	(7.0)	Apr. 22	3.7	Nov. 21	6.9	(3.3)	3.2	3.2
Average	Sept. 20	.....	Mar. 28	.....	Sept. 20	.....	3.19	2.97	3.14

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TABLE 66.—*Total evaporation from grass and alkali lands in the valley floor.*

Inclosing contours.	Area (square miles).	Average depth to ground-water (feet).	Annual depth of evaporation (inches).			Equivalent flow (second-feet).
			Summer.	Winter.	Total.	
3 feet	11.89	2.5	28.2	6.8	35.0	31
3–4 feet	17.66	3.5	22.5	5.4	27.9	36
4–8 feet	25.04	5.5	11.4	2.7	14.1	26
	54.59	.....	.....	.....	.....	93

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 295

GAZETTEER OF SURFACE WATERS OF CALIFORNIA

PART I. SACRAMENTO RIVER BASIN

PREPARED UNDER THE DIRECTION OF JOHN C. HOYT

BY

B. D. WOOD

In cooperation with the State Water Commission and the Conservation Commission of the State of California

WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

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NOTE.

A complete list of the gaging stations maintained in the Sacramento River basin from 1888 to July 1, 1912, is presented on pages 98–99.

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GAZETTEER OF SURFACE WATERS IN SACRAMENTO RIVER BASIN, CALIFORNIA.

By B. D. Wood.

INTRODUCTION.

This gazetteer is the first of a series of reports on the surface waters of California prepared by the United States Geological Survey under cooperative agreement with the State of California as represented by the State Conservation Commission; George C. Pardee, chairman, Francis Cuttle, and J. P. Baumgartner; and by the State Water Commission, Hiram W. Johnson, governor, Charles D. Marx, chairman, S. C. Graham, Harold T. Power, and W. F. McClure. Louis R. Glavis is secretary of both commissions. The reports are to be published as Water-Supply Papers 295 to 300 and will bear the following titles:

295. Gazetteer of surface waters of California, Part I, Sacramento River basin.
296. Gazetteer of surface waters of California, Part II, San Joaquin River basin.
297. Gazetteer of surface waters of California, Part III, Great Basin and Pacific coast streams.
298. Water resources of California, Part I, Stream measurements in the Sacramento River basin.
299. Water resources of California, Part II, Stream measurements in the San Joaquin River basin.
300. Water resources of California, Part III, Stream measurements in the Great Basin and in the Pacific coast river basins.

The gazetteers embrace descriptions of all the streams named on the best available maps. For the Sacramento basin these maps are chiefly those published by the United States Geological Survey as sheets of the Topographic Atlas of the United States. For districts along the western border of that basin, not yet mapped by the Survey, privately compiled and published county maps have been used. All township and range numbers have been determined from the county maps and all refer to the Mount Diablo base and meridian.

Each stream is described as rising near the point at which its beginning is shown on the map, and the elevation of that point is given as the elevation of the source. It is, of course, recognized that this method does not give results of great precision, but it probably causes no greater errors in the determination of length and fall than would be caused by extending each stream to the head of the divide

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between its basin and that of the adjoining streams. It should be understood however, that all statements of elevation, length, and fall are merely approximate.

The Survey maps used in the preparation of the gazetteer of streams in the Sacramento basin are listed below in alphabetic order. An index map showing the area covered by each sheet may be obtained by applying to the Director, United States Geological Survey, Washington, D. C.

Topographic sheets covering areas in Sacramento River basin.[1]

Alturas.
Bidwell Bar.
Carbondale.
Chico.
Colfax.
Colusa.
Courtland.
Davisville.
Downieville.
Dunnigan.
Elk Grove.
Fairoaks.
Florin.
Honey Lake.
Indian Valley special.
Knights Landing.
Lassen Peak.
Lincoln.
Lodi.
Marcuse.
Marysville.
Modoc Lava Bed.
Napa.
Nicolaus.
Placerville.
Pleasant Grove.
Pyramid Peak.
Red Bluff.
Redding.
Rio Vista.
Roseville.
Sacramento.
Sacramento Valley.[2]
Shasta.
Sheridan.
Sierraville.
Smartsville.
Tehama.
Truckee.
Vacaville.
Vina.
Willows.
Woodland.

County maps of Sacramento River basin.

	Publisher.
Butte County	Punnett Bros.
Eldorado and Amador counties	Do.
Glenn and Colusa counties	Do.
Mendocino and Lake counties	Do.
Napa and Solano counties	Do.
Nevada County	Do.
Placer County	Do.
Plumas County	Do.
Sacramento and San Jacinto counties	Do.
Sierra County	Do.
Yolo County	Do.
Yuba and Sutter counties	Do.
Shasta County	Denny.
Lassen County	Starkweather.

[1] An act of Congress approved Feb. 18, 1897, prescribes that the maps shall be disposed of by sale. They are sold at the rate of 5 cents a sheet of standard size. If 100 or more standard topographic atlas sheets, or their equivalent in value in other maps, are ordered, a discount of 40 per cent will be made from the retail price—that is, 100 standard topographic atlas sheets will cost $3.

[2] The price of the Sacramento Valley map is 15 cents; when included in wholesale orders, 9 cents.

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GAZETTEER.

The letter L or R in parenthesis after the name of a stream indicates that the stream is a tributary from the left or right, respectively, to the stream into which it flows. The word "sheet" refers to Geological Survey atlas sheets.

Acorn Hollow Creek (L); rises in Tehama County, near the center of T. 25 N., R. 1 W., at altitude 400 feet above sea level; flows southwestward 2 miles, then north of west 1 mile into Toomes Creek (tributary to Sacramento River); fall, 150 feet. Vina sheet.

Adler Creek (R); rises in Shasta County, in the eastern part of T. 34 N., R. 5 W., at altitude 1,400 feet above sea level; flows southeastward 2 miles and joins Sacramento River at Morley; fall, 650 feet. Redding sheet.

Aiken Gulch Creek (L); rises in Shasta County, in the southwestern part of T. 29 N., R. 7 W., at altitude 1,000 feet above sea level; flows southeastward 6 miles into Middle Fork Cottonwood Creek (tributary through Cottonwood Creek to the Sacramento); fall, about 200 feet. Red Bluff sheet.

Alamo Creek (R); rises in Solano County, in the northern part of T. 6 N., R. 2 W.; flows southeastward about 22 miles into the head of Cache Slough (tributary through Steamboat Slough to the Sacramento); intermittent; tributary Ulatis Creek. Vacaville sheet.

Alder Creek (L); Eldorado County; rises in the northwestern part of T. 9 N., R. 16 E., on the north slope of Alder Hill, at altitude 6,900 feet above sea level; flows northwestward 11 miles into South Fork of American River (tributary through American River to the Sacramento); fall 3,400 feet. Pyramid Peak sheet.

Alder Creek (L); Sacramento County; rises in the central part of T. 9 N., R. 8 E., near White Rock, at altitude 450 feet above sea level; flows north of west 6 miles into American River (tributary to the Sacramento); fall about 350 feet. Sacramento sheet.

Alder Creek (R); Shasta County; rises in the eastern part of T. 34 N., R. 5 W., at altitude 1,400 feet above sea level; flows southeastward into Sacramento River; length, 1 mile; fall, 600 feet; intermittent. Redding sheet.

American Basin; east side Sacramento River, just above American River and along the east side of Feather River to Nicolaus; receives water which escapes through breaks in the south side Bear River levees and in the east side Feather River and Sacramento River levees above Bear River; also Sierra Nevada foothill drainage which reaches Sacramento Valley between Bear and American rivers. At flood stages this basin is the principal outflow point of American River waters. Its contents at flood height range from 15,000,000,000 to 25,000,000,000 cubic feet of water.

Sacramento River when in flood or at any stage at or above banks fills American Basin to the height of its own water at the mouth of American River. The filling begins by inflow of water through a number of sloughs-deep channels leading from the interior of the basin to Sacramento River just above American River. As soon as Sacramento River is bank-full it sends water across banks unobstructed near the mouth of American River and through breaks in its east side levees just below the mouth of Feather River into the basin until the whole surface of the water in the basin rises and falls with the rise and fall of the river.

Sacramento Valley map. Report of Examining Commission on Rivers and Harbors to the Governor of California (C. T. Reed, C. E. Grunsky, J. J. Crawford, commissioners), Sacramento, 1890, pp. 63–64.

American Canyon Creek (L) rises in Eldorado County, in the northeastern part of T. 12 N., R. 9 E., at altitude 2,100 feet above sea level; flows northwestward into Middle Fork of American River (tributary through North Fork of American and American River to the Sacramento); length about 3 miles; fall 2,100 feet. Placerville sheet.

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American River (L); formed by the union of North, Middle, and South forks; flows southwestward to junction with the Sacramento just above the city of Sacramento. The drainage area lies on the western slope of the Sierra Nevada south of Bear and Yuba River basins, west of Lake Tahoe and the Truckee River basin and north of the Cosumnes and Mokelumne River basins. The area is triangular in shape, about 80 miles long, has a maximum width of 50 miles along the crest of the Sierra, and comprises about 2,000 square miles.

The North and Middle forks unite near Auburn, about 20 miles above the mouth of the South Fork, which is only a few miles above Folsom. Each of the forks is about 60 miles long. The North Fork drains an area comprising 349 square miles; the Middle Fork 640 square miles, and the South Fork 861 square miles. Each of the forks has many other forks, branches, and tributaries.

Almost half of the American River basin exceeds 5,000 feet in altitude and probably one-third of it ranges from 6,000 to 9,000 feet. The lower elevations of the basins are barren or sparsely timbered; the higher areas support a good growth of timber. All the upper part of the basin, amounting to considerably more than half the area, is included in a Federal forest reserve.

Mean annual precipitation ranges from 21 inches in Sacramento Valley to approximately 60 inches near the summit of the Sierra Nevada, where it occurs as snow that does not disappear until summer. In the foothill region it ranges from 25 to 30 inches and in the central region from 45 to 55 inches.

American River, like the Yuba and the Bear, has received large quantities of débris from the hydraulic mines in the regions about its source and its bed is practically filled up with this material.

The river is torrential in character. Its summer flow is small but in winter and spring it sometimes rises very rapidly and to very high stages. Its flood stage is of short duration, rarely more than a day.

At Folsom, where the river leaves its granite canyon, it enters on a stretch in which it flows over and between cobble bars. Just below Folsom the hills on the south are farther back from the river and a high gravel bar rises from the waters edge. Near its mouth the river flows in a broad, shallow channel whose sandy bottom is 4 to 10 feet below the tops of the natural banks. At high stages the water spreads over the banks toward Sacramento River, connecting toward the north with the American Basin and toward the south standing against the Sacramento City levees and thus entering channel of Sacramento River close above Sacramento.

Storage on a large scale is not possible in the American River basin, although the Middle and South forks afford storage sites for power and mining. The minimum flow of the streams in the American River basin, with the existing fall, is sufficient to develop about 100,000 horsepower without storage, of which about 40 per cent is on the South Fork and only 30 per cent on the Middle Fork.

The upper part of the drainage area of American River shows features of glaciation in the many small lakes, some of which have been dammed and used for storage in connection with mining.

Gaging stations at Fairoaks (1904–1909), on the North Fork near Colfax (1911), and on the South Fork near Placerville (1911).

Surveys and data: Truckee, Pyramid Peak, Colfax, Placerville, and Sacramento sheets. Water-Supply Paper U. S. Geol. Survey No. 271, pp. 151–153. See also Pleasant Grove, Roseville, Arcade, Antelope, Folsom, Brighton, Mills, and American sheets.

American River, Middle Fork (L); rises in Placer County in the northeastern part of T. 15 N., R. 15 E., on the west slope of Needle Peak (altitude 8,920 feet) and Granite Chief, at an altitude exceeding 8,500 feet above sea level; takes a general southwesterly course to its junction with the North Fork of American River (tributary through American River to the Sacramento) near Auburn; length, about 60 miles;

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drainage area, 861 square miles; fall, nearly 9,000 feet. The head-water streams interlock with streams flowing eastward to the Truckee, northward to the North Fork of the American, and southward to Rubicon River, one of the lower tributaries of the Middle Fork. Principal tributaries of this fork of the American are Rubicon and North Fork of Middle Fork of American rivers. Truckee, Colfax, Placerville, and Sacramento sheets.

American River, Middle Fork, North Fork of (R); rises in Placer County, in the northern part of T. 15 N., R. 13 E., at altitude 6,500 feet above sea level; takes an irregular but in general southwesterly course to its junction with Middle Fork of American River (tributary to North Fork of American to American River and thus to the Sacramento); length about 18 miles; fall about 5,000 feet; flows through a deep canyon. Colfax sheet.

American River, Middle Fork, South Fork of. See *Rubicon River*.

American River, North Fork (R); rises in Placer County, in the southern part of T. 16 N., R. 15 E., on the north slope of Needle Peak (altitude 8,920 feet); flows in general northwestward to Soda Springs, then southwestward to its junction with the South Fork near Folsom. The head of this fork of the American lies in a region of high peaks and the headwater rivulets interlock with streams flowing northward to the Yuba, eastward to Truckee River and Lake Tahoe, and southward to the Middle Fork of the American. The North Fork receives the Middle Fork near Auburn, and its drainage basin measured at its junction with the South Fork comprises nearly a thousand square miles. It is therefore entitled to rank as the master stream of the American system. Gaging station near Colfax, 1911. Truckee, Colfax, and Sacramento sheets.

American River, North Fork of North Fork (R); rises in Placer County, in the eastern part of T. 17 N., R. 12 E., at altitude 5,500 feet above sea level; flows southwestward to its junction with North Fork of American (tributary through American River to the Sacramento) in the northern part of T. 15 N., R. 11 E.; length, 12 miles; fall, 4,500 feet. Colfax sheet.

American River, North Fork of North Fork, East Fork of (L); rises in Placer County, in the eastern part of T. 16 N., R. 12 E., at altitude 6,500 feet above sea level; flows north of west 3 miles, then southwest 2½ miles to its junction with the North Fork of the North Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 2,800 feet; principal tributary, Monumental Creek. Colfax sheet.

American River, South Fork (L); rises in Eldorado County, in the eastern part of T. 11 N., R. 17 E., in Audrain Lake, at altitude 7,150 feet above sea level; flows westward to its junction with the North Fork of American River (tributary through American River to the Sacramento) near Folsom. The river is about 60 miles long and its drainage area comprises 861 square miles; fall, 7,000 feet; through the greater part of its course it flows in a deep canyon. Pyramid Peak, Placerville, and Sacramento sheets.

American River, South Fork, Silver Fork of (L); rises in Amador County, in the southern part of T. 10 N., R. 17 E., in Silver Lake, at altitude 7,150 feet; flows northwestward into South Fork of American River (tributary through American River to the Sacramento); length, 13 miles; fall, 3,150 feet; principal tributary, stream from Twin Lakes. Pyramid Peak sheet.

Angel Meadow Creek. See *Willow Creek*, tributary to McCloud River.

Angel Slough. Butte Basin, east of Sacramento River and west of Butte Creek, in Butte, Glenn, and Colusa counties; extends southward from Little Chico Creek to Butte Creek.

Antelope Creek (R); Placer County; rises in the southern part of T. 12 N., R. 7 E., at altitude 900 feet above sea level; flows southwestward 9 miles into Linda Creek (tributary to Bush Lake, American Basin); fall 650 feet; intermittent. Sacramento sheet.

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Antelope Creek (L); Tehama County; rises near the center of T. 28 N., R. 3 E., at altitude 5,000 feet above sea level; flows very irregularly westward about 33 miles into the northern part of Rio de los Berrendos Rancho, where it emerges from the deep canyon through which its upper course lies, and then winds southward 10 miles, discharging its waters through New Creek to Salt Creek and thus to the Sacramento through Craig Creek, which enters the Sacramento opposite Blackberry Island, and through several unnamed channels; intermittent below canyon; fall from head to lowest mouth on Sacramento, about 4,800 feet; principal tributary, Little Antelope Creek; many small unnamed tributaries. Lassen Peak and Tehama sheets.

Antelope Creek, Little (L); rises in Tehama County, near the center of T. 27. N., R. 1 E., at altitude 2,200 feet above sea level; flows in general somewhat south of west to its junction with Antelope Creek (tributary to Sacramento River) 1 mile below Sycamore Lodge in Rio de los Berrendos; length, 16 miles; fall, 1,940 feet. Tehama sheet.

Antone Canyon Creek (R); rises in Placer County, in the western part of T. 15 N., R. 13 E., at altitude 6,200 feet above sea level; flows southwestward 3 miles into North Fork of Middle Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,700 feet. The canyon is called Antone Canyon for about 2 miles below the junction of the creek with the North Fork of the Middle Fork of American River. Colfax sheet.

Arcade Creek (L); rises in Sacramento County, in the northern part of Rancho de San Juan, at altitude 200 feet above sea level; takes a general southwesterly course about 30 miles, and discharges into the American Basin 3 miles north of the City of Sacramento; fall 280 feet; intermittent. Antelope, Arcade, and Fairoaks sheets.

Arkansas Ravine Creek (L); rises in Plumas County, in the southern part of T. 23 N., R. 7 E., at altitude 5,400 feet above sea level; flows northwestward into Coldwater Creek, tributary to Coquette Creek, which flows through Little North Fork Feather River to Middle Fork Feather, and thus through Feather River to the Sacramento; length, 1 mile; fall, 550 feet. Bidwell Bar sheet.

Ash Creek (L); Lassen County; rises in the north-central part of T. 36 N., R. 11 E., at altitude (approximate) 6,000 feet above sea level; flows northwesterly, and unites with Pit River (which flows into the Sacramento) about 4 miles north of Bieber; length, about 40 miles; fall, 1,900 feet; principal tributaries, Cottonwood and Willow creeks; gaging station at Adin, 1904–5. Modoc Lava Bed and Alturas sheets.

Ash Creek (L); Shasta County; rises in the eastern part of T. 30 N., R. 3 W.; flows westward 4 miles into Sacramento River; fall, about 300 feet. Red Bluff sheet.

Ash Creek (R); Siskiyou County; rises in the northeastern part of T. 41 N., R. 3 W., on the eastern slope of Mount Shasta, at altitude (approximate) 8,000 feet above sea level; flows eastward and then southward; carries water in lower course only in times of flood; ordinarily the water sinks into the porous lavas and percolates southward, finally emerging as springs which discharge into McCloud River (tributary to Pit River and thus to the Sacramento). Shasta and Modoc Lava Bed sheets.

Auburn Ravine Creek (L); rises in Placer County, in the northern part of T. 12 N., R. 8 E., 1 mile north of Auburn, at altitude 1,500 feet above sea level; takes a very irregular but in general southwesterly course to American Basin which it enters through Bunkham Slough; about 35 miles long; intermittent, carrying no water below the foothills except in time of flood; fall in the 10 miles of its course that lies within the foothills, about 1,100 feet; tributaries Dutch Ravine, Orchard and Rock creeks. Sacramento sheet; also Lincoln, Roseville, and Pleasant Grove sheets.

Audrain Lake; Eldorado County, T. 11 N., on the line between Rs. 17 and 18 E., outlet South Fork of American River (tributary through American River to the Sacramento); elevation, 7,150 feet. Pyramid Peak sheet.

Avalanche Ravine Creek (L); rises in Sierra County, in the northern part of T. 19 N., R. 12 E., on the east slope of Keystone Mountain, at altitude 6,700 feet above

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sea level; flows northwestward 2 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba River and Yuba River to Feather River and thus to the Sacramento); fall, 2,500 feet. Downieville sheet.

Axford Creek (L); rises in Plumas County, in the southwestern part of T. 23 N., R. 7 E., on the south slope of Grizzly Hill, at altitude 5,900 feet above sea level; flows southwestward into Little North Fork of Feather River (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); length, 2 miles; fall, 1,400 feet. Bidwell Bar sheet.

Babel Slough; Yolo Basin, extending from Sacramento River southeastward toward the head of Winchester Lake. Sheet M, Sacramento Valley map.

Backbone Creek (R); rises in Shasta County, near the center of T. 35 N., R. 6 W., on the eastern slope of Trinity Mountains, at altitude 4,200 feet above sea level; flows southeastward into Sacramento River at Kennett; length, about 14 miles; fall, 3,500 feet, of which 2,000 feet occurs in 5 miles at the head of the stream. Red Bluff and Redding sheets.

Backbone Creek, Little (R); rises in Shasta County, in the southwestern part of T. 34 N., R. 5 W., on the south slope of Bohemotash Mountain, at altitude 4,000 feet above sea level; flows southeastward 4 miles into Sacramento River at Kennett; fall, 3,250 feet, of which 2,500 feet occurs in about 2 miles at head. Redding sheet.

Backbone Creek, North Fork (L); rises in Shasta County, in the eastern part of T. 35 N., R. 6 W., at altitude 2,250 feet above sea level; flows southeastward about 4 miles into Backbone Creek (tributary to Sacramento River); fall, 900 feet. Redding sheet.

Bailey Creek (L); rises in Shasta County, in the southern part of T. 31 N., R. 3 E., at altitude 4,800 feet above sea level; flows southwestward 11 miles to junction with Rock Creek (tributary to North Fork of Battle Creek and thus through Battle Creek to the Sacramento); fall, 2,400 feet. Lassen Peak sheet.

Bailey Creek (R); rises in Shasta County, in the central part of T. 34 N., R. 4 W., on the eastern slope of O'Brien Mountain, at altitude 1,500 feet above sea level; flows eastward 2 miles into McCloud River (tributary to Pit River and thus to the Sacramento) 1 mile north of Baird; fall, 750 feet. Redding sheet.

Barker Creek (R); rises in Placer County, in the northeastern part of T. 14 N., R. 16 E., on the south slope of Barker Peak, at altitude 7,500 feet above sea level; flows southward 1½ miles, then northwestward 3½ miles into Rubicon River (tributary to Middle Fork of American River and thus through North Fork of American River and American River to the Sacramento); fall 2,600 feet; tributary, West Meadow Creek. Truckee sheet.

Basin Hollow Creek (R); rises in Shasta County, in the southwestern part of T. 32 N., R. 2 W., at altitude 900 feet above sea level; flows southwestward about 5 miles into Cow Creek (tributary to Sacramento River); fall, 350 feet; intermittent. Redding sheet.

Bartlett Creek (R); a creek to which no name is attached on Punnett's map rises in the northeastern part of T. 15 N., R. 8 W., flows generally eastward about 3½ miles to Bartlett Springs, then southeastward to the North Fork of Cache Creek (tributary through Cache Creek to Yolo Basin) 3 miles below Bartlett Springs. The name Bartlett Creek is applied on this map to a stream called on the Land Office and post route maps the North Fork of Cache Creek. Chandler[1] applies the name Bartlett Creek to the stream flowing through Bartlett Springs.

Battle Creek (L); formed in Shasta County, in the southeastern part of T. 30 N., R. 1 W., by union of North and South forks. The North Fork, which may be considered the continuation of the main stream, rises on the east slope of Latur Butte, in

[1] Chandler, A. E., Water storage on Cache Creek, California: Water-Supply Paper U. S. Geol. Survey No. 45, 1901, p. 27.

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T. 32 N., R. 3 E., at altitude 5,000 feet above sea level, and flows southwestward to its junction with the South Fork (q. v.); below the forks Battle Creek flows westward, its channel joining that of the Sacramento opposite Bloody Island; total length, about 35 miles; fall from head of North Fork to the Sacramento, 4,600 feet, of which 2,000 feet occurs in the 8 miles above the mouth of North Fork. Lassen Peak and Red Bluff sheets.

Battle Creek, South Fork (L); rises in Tehama County, in the southern part of T. 30 N., R. 4 E., at altitude 6,000 feet above sea level; flows southward 4 miles into Battle Creek Meadows, then somewhat north of west 22 miles; unites with the North Fork to form Battle Creek, which is tributary to the Sacramento; fall above Battle Creek Meadows, 1,200 feet; fall above junction with North Fork, 5,000 feet; most of course lies in deep canyon. Lassen Peak sheet.

Bear Creek (L); Colusa County; rises in the east-central part of T. 16 N., R. 6 W.; flows southward 24 miles to its junction with Cache Creek (tributary to Yolo Basin) in the southern part of T. 13 N., R. 4 W.; other than the North Fork, Bear Creek is the only important tributary to Cache Creek. Twelve miles up Bear Creek is Bear Valley, 10 miles long and 2 miles in average width. Below the valley there is little open country and for the last 5 miles the creek traverses a narrow canyon. Two miles below Bear Valley Sulphur Creek empties into Bear Creek. Sulphur Creek drains a district in which large quicksilver mines are operated and many silver and mineral springs exist in its own bed. By the time it reaches Bear Creek its water contains so much mineral matter that it renders the water of the larger creek brackish and salty, unfitting it for irrigation. Bear Creek is said rarely to become dry.

Punnett's map of Colusa and Yolo Counties. Water-Supply Paper U. S. Geol. Survey No. 45, 1901, p. 27.

Bear Creek (R); Eldorado County; rises in the northwestern part of T. 12 N., R. 11 E., at altitude 3,200 feet above sea level; flows southwestward into the West Fork of Rock Creek (tributary through Rock Creek to South Fork of American River and thus through American River to the Sacramento); length 2 miles; fall 600 feet. Placerville sheet.

Bear Creek (R); Plumas County; rises in the northeastern part of T. 23 N., R. 8 E., at altitude 5,500 feet above sea level; flows very irregularly southwestward 4 miles, then southeastward 4 miles into Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,200 feet. Bidwell Bar sheet.

Bear Creek (L); Shasta County; rises in the southern part of T. 32 N., R. 2 E., at altitude 4,400 feet above sea level; flows southwestward (by general course) to junction with Sacramento River at Logans Ferry; length, about 35 miles; fall, 4,000 feet, of which 2,400 feet occurs in the first 15 miles of course. Lassen Peak and Red Bluff sheets.

Bear Creek (R); Sierra County; rises in the southern part of T. 19 N., R. 11 E., at altitude 5,900 feet above sea level; flows southwestward into Middle Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); length 4 miles; fall 2,500 feet. Colfax sheet.

Bear Creek (R); Siskiyou County, southeastern part; rises near the center of T. 40 N., R. 2 E., on the southern slope of Bear Mountain, at altitude (approximate) 4,700 feet above sea level; flows in a general southeasterly course about 16 miles and unites with Fall River (tributary to Pit River and thus to the Sacramento) near its head; fall, about 1,200 feet; intermittent in upper part of course. Modoc Lava Bed sheet.

Bear Creek, Little (L); Placer County; rises in the southeastern part of T. 16 N., R. 10 E., at altitude 4,500 feet above sea level; flows southwestward about 4 miles into Bear River (tributary through Feather River to the Sacramento) 1 mile north of Dutch Flat; fall 1,600 feet. Colfax sheet.

Bear Creek, Little (R); Plumas County; rises in the southwestern part of T. 23 N., R. 8 E., on the eastern slope of Mount Ararat, at altitude 5,500 feet above sea level;

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flows southeastward 3 miles into Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,900 feet. Bidwell Bar sheet.

Bear Gulch Creek (R); rises in Shasta County, in the western part of T. 34 N., R. 1 W., at altitude 2,200 feet; flows southwestward 2 miles into Cedar Creek (tributary to Little Cow Creek, which flows into Cow Creek, which discharges to the Sacramento); fall, about 900 feet. Redding sheet.

Bear Lakes; Plumas County, northwestern part of T. 21 N., R. 12 E.; a group of eight connected lakes, all small, discharging by a stream 2 miles long, flowing northward to Gray Eagle Creek (tributary to Middle Fork of Feather River and thence through Feather River to the Sacramento). The highest of these lakes is about 6,700 feet above sea level; the lowest of the chain is at altitude 6,450 feet; the fall of the outlet stream to its junction with Gray Eagle Creek is about 300 feet. Downieville sheet.

Bear River (L); rises in Nevada County on the eastern slope of the Sierra Nevada in the central part of T. 17 N., R. 12 E., near Emigrant Gap, at altitude 5,500 feet above sea level; flows southwestward to its junction with Feather River (tributary to the Sacramento) about 15 miles south of Marysville; it forms a boundary line between Nevada and Placer counties and closely parallels the Bear-American divide, which is 1 to 2 miles south of it. Its principal tributaries are Steep Hollow Creek, Greenhorn Creek and Wolf Creek, all from the north.

The basin is about 60 miles long and not more than 10 miles wide and comprises a total area of less than 300 square miles. The mean annual precipitation ranges from 21 inches in the valley to 52 inches at the source of the river where much of it falls as snow that soon disappears.

The area drained by the Bear has been extensively mined and its bottom lands have been covered with silt and sand to so great a depth that in places levees have been built on the old upland to prevent its inundation. The mouth of the Bear has been almost obliterated by the débris brought down from the mines; from the Feather River side it can scarcely be found. The river water, after passing through the narrow channel near the lower bridges, spreads out over a great expanse of brush-covered Feather River bench lands. Colfax, Smartsville, and Sacramento sheets.

Beatson Hollow Creek (L); rises in Butte County in the northwestern part of T. 20 N., R. 4 E., on the west slope of Table Mountain, at altitude 1,100 feet above sea level; flows southwestward 5 miles into Coal Canyon Creek (tributary through Chambers Ravine Creek to Dry Creek and thus to Butte Basin); fall about 800 feet. Chico sheet.

Beaver Creek (L); Lassen County; rises in the northwestern part of T. 34 N., R. 7 E., on the northwestern slope of Black Butte, 5,400 feet above sea level; flows in general northwesterly to its junction with Pit River (tributary to Sacramento River) a mile west of Pittville; length, 18 miles; fall, about 2,000 feet, of which 1,800 feet occurs in the first 8 miles of course. Lassen Peak and Modoc Lava Bed sheets.

Beaver Creek (R); Yuba County; rises in the central part of T. 19 N., R. 8 E., at altitude 3,000 feet above sea level; flows southward 2 miles into Willow Creek (tributary through North Fork of Yuba River to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 800 feet. Smartsville sheet.

Beaver Lake; Colusa Basin, west side of Sacramento River, in Jimeno Rancho just north of the westward bend in the river. Sheet G, Sacramento Valley map.

Bee Creek (R); rises in Shasta County, in T. 30 N., R 7 W., at altitude 700 feet above sea level; flows north of east 2 miles into North Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River) 1½ miles south of Ono; fall, about 25 feet (?). Red Bluff sheet.

Beegum Creek (R); rises in Tehama County, in the northeastern part of T. 27 N., R. 10 W., on the north slope of North Yolla Bolly Mountain, 6,000 feet above sea level; flows northeastward along the west base of Beegum Peak, and unites with Middle Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River); length, 16 miles; fall, 4,200 feet. Red Bluff sheet.

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Berry Creek (L); rises in Butte County, in the western part of T. 21 N., R. 6 E., on the south slope of Bald Rock, at altitude 3,000 feet above sea level; flows westward 3 miles, then northwestward 3 miles to junction with North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,400 feet. Bidwell Bar sheet.

Bidwell Creek (R); rises in Butte County, in the southern part of T. 22 N., R. 5 E., at altitude 2,900 feet above sea level; flows southeastward 2 miles into French Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 1,000 feet. Bidwell Bar sheet.

Big Butte Creek. See *Butte Creek.*

Big Canyon Creek. See *Canyon Creek, Big.*

Big Chico Creek. See *Chico Creek, Big.*

Big Grizzly Creek. See *Grizzly Creek.*

Big Iowa Canyon Creek. See *Iowa Canyon Creek.*

Big Lake; a permanent water body on the east edge of the tidal marsh near the lower end of Yolo Basin, west of Elkhorn Slough and Merritt Island. Sheet M, Sacramento Valley map.

Bird Creek (R); Plumas County; rises in the southeastern part of T. 23 N., R. 9 E., at altitude 6,100 feet above sea level; flows east of south into Onion Valley Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); 1 mile long; fall, 600 feet. Downieville sheet.

Bird Creek (R); Yolo County; rises in the central part of T. 12 N., R. 2 W.; flows southeastward into T. 12 N., R. 1 W., then northeastward into Colusa Basin. Sheet F, Sacramento Valley map.

Black Canyon Creek (R); rises in Placer County, in the northeastern part of T. 15 N., R. 12 E., at altitude 6,000 feet above sea level; flows southward into Secret Canyon Creek (tributary to North Fork of Middle Fork of American River and thus to North Fork of American River, which flows through the American to the Sacramento); length, 2 miles; fall, 1,400 feet. Colfax sheet.

Black Hawk Creek (L); rises in Plumas County, in the northern part of T. 24 N., R. 9 E., at altitude 4,200 feet above sea level; flows northeastward about 3 miles into Spanish Creek (tributary to Indian Creek, and thence through North Fork of Feather River to Feather River and the Sacramento); total fall 1,000 feet. Downieville sheet.

Bloody Run (L); rises in Nevada County, in the east-central part of T. 18 N., R. 10 E., at altitude 5,000 feet above sea level; flows eastward 4 miles, then northward 1 mile into Middle Fork Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); fall, 2,600 feet, of which 1,600 feet occurs in the last mile and a half. Colfax sheet.

Blue Canyon Creek (R); rises in Placer County, in the northwestern part of T. 16 N., R. 11 E., at altitude 5,300 feet above sea level; flows southwestward 7 miles into North Fork of North Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); fall 3,100 feet. Colfax sheet.

Blue Lake; northeastern part of Lassen County, in western part of T. 38 N., R. 15 E.; inlets, two small unnamed streams; outlet, a stream about 5 miles long flowing circuitously westward into Clark Creek (West Valley canyon), which is tributary through South Fork of Pit River to Pit River and thus to the Sacramento; elevation, about 6,500 feet. Alturas sheet.

Blue Lake; Nevada County, northern part of T. 17 N., R. 12 E.; no outflowing stream mapped, but the lake lies in an area draining southward to South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); elevation 6,000 feet above sea level. Colfax sheet.

Blue Tent Creek (R); rises in Tehama County, near the center of T. 28 N., R. 4 W., about 500 feet above sea level; flows southeastward into Sacramento River 2 miles above Red Bluff; about 8 miles long; fall, 200 feet. Tehama sheet.

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Bollibokka Creek (L); rises in Shasta County, in the southern part of T. 36 N., R. 3 W., on the west slope of Bollibokka Mountain, at altitude 3,000 feet above sea level; flows northwestward 2 miles into McCloud River (tributary through Pit River to the Sacramento); fall, 1,800 feet. Redding sheet.

Boomer Creek (R); rises in Butte County, near the center of T. 21 N., R. 7 E., at altitude 4,700 feet above sea level; flows southwestward into Fall River (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); 2½ miles long; fall, 200 feet. Bidwell Bar sheet.

Boulder Creek (R); Shasta County; rises in the southwestern part of T. 32 N., R. 6 W., on the southeast slope of Bally Mountain, at altitude 2,300 feet above sea level; flows eastward 2 miles into Clear Creek (tributary to Sacramento River); fall, about 1,300 feet. Red Bluff sheet.

Boulder Creek (R); Shasta County; rises in the eastern part of T. 32 N., R. 5 W., southeast of Quartz Hill, at altitude 700 feet above sea level; flows southeastward 3 miles into Churn Creek (tributary to Sacramento River); fall, 125 feet; intermittent. Redding sheet.

Boulder Creek (R); Shasta County; rises near the center of T. 32 N., R. 7 W., on the east slope of Bally Mountain, at altitude 2,600 feet; flows northeastward 2 miles into Clear Creek (tributary to Sacramento River); fall, 1,500 feet. Red Bluff sheet.

Bounde Creek (L); Glenn County, Larkin Children's ranch; an intermittent creek in the Colusa Basin, discharging southward to Willows Creek (to Colusa Basin) about 2 miles west of Princeton. Sheet C, Sacramento Valley map.

Bowman Lake; Nevada County, northern part of T. 18 N., R. 12 E., inlet Canyon Creek from French and Faucherie lakes; outlet Canyon Creek, which leaves the lake through two channels, both of which are dammed, to South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation 5,300 feet. In the 8 miles below Bowman Lake Canyon Creek falls 2,600 feet; the lake is nearly 2 miles long, half a mile wide, and contains several small islands. Colfax sheet.

Brandy Creek (R); rises in Shasta County, in the southern part of T. 32 N., R. 7 W., on the southeast slope of Bally Mountain, at altitude 2,700 feet above sea level; flows northeastward into Clear Creek (tributary to Sacramento River) at Stella; length, 3 miles; fall, 1,600 feet. Red Bluff sheet.

Breakneck Canyon Creek (L); rises in Butte County in eastern part of T. 24 N., R. 4 E., at altitude 5,300 feet above sea level; flows southwestward 4 miles into West Branch of Feather River (tributary through North Fork of Feather River to Feather River and thence to the Sacramento); fall 2,400 feet. Bidwell Bar and Chico sheets.

Brewer Creek; rises in Siskiyou County, on northeastern slope of Mount Shasta, at altitude 8,000 feet above sea level; flows northeastward about 5 miles; its waters then sink into the lava beds and join the underground drainage tributary through springs to McCloud River (tributary to Pit River and thus to the Sacramento). Shasta sheet.

Brimstone Creek (L); rises in Placer County, in the southern part of T. 15 N., R. 11 E., at altitude 4,000 feet above sea level; flows irregularly southwestward about 6 miles into Shirttail Canyon Creek (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,600 feet. Colfax sheet.

Briscoe Creek (L); rises in Glenn County, in the eastern part of T. 19 N., R. 8 W.; flows southward about 5 miles, then takes a general northeasterly course about 11 miles to junction with Stony Creek (tributary to Sacramento River); drains a mountainous area of which Sheetiron Mountain forms the summit. The creek intersects a conglomerate bed in a narrow gorge that is in places only 3 feet wide. Punnett's map of Glenn and Colusa counties. See also Water-Supply Paper U. S. Geol. Survey No. 86, pp. 34–47.

Britona Creek (R); rises in Yolo County in T. 11 N., R. 1 W., at altitude 250 feet above sea level; flows east of north 4 miles, then eastward 1 mile; intermittent; water sinks before reaching Colusa Basin. Dunnigan sheet.

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Brock Creek (R); rises in Shasta County, in the northwestern part of T. 34 N., R. 2 W., on the east slope of Brock Mountain, at altitude 2,000 feet above sea level; flows east of south 2 miles into Pit River (tributary to Sacramento River); fall, 1,100 feet; intermittent in upper course. Redding sheet.

Brush Creek (R); Colusa County; rises in the southeastern part of T. 13 N., R. 3 W.; flows northeastward into Colusa Basin; intermittent. Sheet F, Sacramento Valley map.

Brush Creek (R); Eldorado County; rises in the eastern part of T. 12 N., R. 12 E., on the north slope of Saddle Mountain, at altitude 4,500 feet above sea level; flows southwestward 6 miles into South Fork American River (tributary through American River to the Sacramento); fall, 2,700 feet. Placerville sheet.

Brush Creek (L); Nevada County; rises in the southeastern part of T. 17 N., R. 8 E., at altitude 2,600 feet above sea level; flows northwestward 1½ miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 1,200 feet. Smartsville sheet.

Brush Creek (L); Placer County; rises in the northeastern part of T. 13 N., R. 12 E., at altitude 4,600 feet above sea level; flows southwestward 1½ miles, then northwestward 3½ miles into Middle Fork of American River (tributary to North Fork of American River and thus through American River to the Sacramento); fall, 2,500 feet, of which 1,400 feet occurs in 2 miles at mouth. Colfax sheet.

Brush Creek (R); Tehama County; rises near the center of T. 25 N., R. 1 E., at altitude about 1,500 feet above sea level; flows southwestward 6 miles, then southward 3 miles into Singer Creek (tributary through Pine Creek to the Sacramento); fall, about 1,200 feet, of which 1,000 feet occurs in the first 4 miles. Chico sheet.

Brushy Creek (L); rises in Placer County, in the eastern part of T. 14 N., R. 10 E., at altitude 3,200 feet above sea level; flows westward 3 miles into Shirttail Canyon Creek (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,400 feet. Colfax sheet.

Buckeye Creek (R); rises in Shasta County, in the northeastern part of T. 32 N., R. 5 W., on Quartz Hill, at altitude 1,100 feet above sea level; flows southeastward 2½ miles into Churn Creek (tributary to Sacramento River); fall, 350 feet, 200 feet being in first half mile of course; intermittent. Redding sheet.

Buckeye Creek (R); rises in Yolo County in the eastern part of T. 12 N., R. 3 W.; flows northeastward into Colusa Basin; intermittent. Sheet F, Sacramento Valley map.

Buck Island Lake; Eldorado County, northwestern part of T. 13 N., R. 16 E., inlet from Rock Bound Lake; outlet a stream 1½ miles long flowing west of north into Rubicon River (tributary through Middle Fork of American River to North Fork of American River and thus through the American to the Sacramento); elevation, 6,400 feet above sea level; fall of outlet, 450 feet; connected with Rock Bound Lake by a stream one-fourth mile long which falls 150 feet. Truckee and Pyramid Peak sheets.

Bucks Creek (L); rises in Plumas County, on the southwestern part of T. 24 N., R. 8 E., at altitude 6,500 feet above sea level; takes general westerly course to its junction with the North Fork of Feather River; length, about 12 miles; fall, 5,200 feet. Bidwell Bar sheet.

Bull Run Creek (R); rises in Plumas County, in the northern part of T. 23 N., R. 12 E., at altitude 6,700 feet above sea level; flows southward 2 miles into Long Valley Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); fall, 1,500 feet. Downieville sheet.

Bunch Canyon Creek (R); rises in Placer County, in the northern part of T. 14 N., R. 9 E., near Colfax, at altitude 2,400 feet above sea level; flows southeastward into North Fork of American River (tributary through American River to the Sacramento); length, 6 miles; fall, 1,900 feet, of which 1,500 feet occurs in one-half mile in a stretch about 2 miles above the mouth of the creek. Colfax sheet.

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Bunkham Slough; Sutter Basin, Sutter County, south of Coon Creek and north of Markham Ravine Creek. Sheridan, Nicolaus, and Vernon sheets.

Burnett's Canyon Creek (L); rises in Placer County, in the southwestern part of T. 16 N., R. 12 E., at altitude 4,800 feet above sea level; flows somewhat north of west to its junction with the North Fork of North Fork of American River (tributary through North Fork of American River to American and thus to the Sacramento); length, 4 miles; fall, 1,700 feet. Colfax sheet.

Burney Creek (L); rises in Shasta County, in the southern part of T. 33 N., R. 3 E., on the south slope of Burney Butte, at altitude 4,800 feet; flows in general somewhat east of north to junction with Pit River (through which it is tributary to Sacramento River) near Pecks, in southwestern part of T. 37 N., R. 3 E.; length, about 24 miles; fall, 2,100 feet; minimum flow several hundred second-feet; estimated horsepower available, 10,000. Lassen Peak and Modoc Lava Bed sheets.

Burton Gulch Creek (R); rises in Plumas County, in the northwestern part of T. 24 N., R. 8 E., at altitude 5,500 feet above sea level; flows southeastward 2 miles into Spanish Creek (tributary to Indian Creek and thence through North Fork of Feather River to Feather River into the Sacramento); fall, 1,500 feet. Bidwell Bar sheet.

Bush Lake; south end of American Basin, just north of junction of American River with the Sacramento; a more or less permanent body of water occupies the lower end of American Basin. It is fed by overflow from the north banks of Sacramento and American rivers and by the general southward drainage of the basin. A long, narrow sloughlike arm extending northward from near its westward end is called Fishermens Lake. Fairoaks and Davisville sheets.

Bushy Lake; Sacramento County, Rancho del Paso, one-half mile north of American River, 1 mile north of east of Sacramento. Brighton sheet.

Butcher Ranch Creek (L); rises in Sierra County, in the northwestern part of T. 20 N., R. 12 E., at altitude 5,500 feet above sea level; flows westward 3 miles into East Fork of North Fork of Yuba River (tributary to North Fork of North Fork of Yuba, Downieville branch, which flows through North Fork of Yuba to Middle Fork of Yuba, and thus through Yuba River to Feather River and the Sacramento); fall, 1,800 feet. Downieville sheet.

Butt Creek (R); rises in Plumas County, the western part of T. 27 N., R. 5 E., at altitude 5,800 feet above sea level; flows eastward about 14 miles, then southeastward through Butte Valley 10 miles to junction with North Fork of Feather River (tributary through Feather River to the Sacramento) 8 miles south of Prattville; total fall, 2,900 feet. Gaging station near Butte Valley 1905–1909. Lassen Peak sheet.

Butte Basin; east side of Sacramento River, northwest and west of Marysville Buttes; receives the water of Butte and Battle Mountain creeks and the east side overflow from Sacramento River, particularly the overflow which reaches the Angel Slough country, and in times of great flood some of the waters of Feather River which flow westward past the northern slope of the buttes.

Butte Basin is a very broad, flat-bottomed depression in which water flows from north to south. The basin discharges into Sutter Basin. Under ordinary circumstances no water from it directly reenters Sacramento River. During a general flood stage of the river the basin holds a slowly moving sheet of water from 30 to nearly 150 square miles in area, according to the amount of inflow into the basin. When the outflow of the basin is checked at the lower end by a river stage above banks, its contents range between 5,000,000,000 and 20,000,000,000 cubic feet of water.

Chico Creek flood waters are poured into the basin from the north, which is, in short, an important supplementary drainway.

Sacramento Valley map. Report of Examining Commission on Rivers and Harbors to the Governor of California (C. T. Reed, C. E. Grunsky, J. J. Crawford, commissioners), Sacramento, 1890, p. 62.

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Butte Creek (L); formed in the northern part of Butte County, in the southeastern part of T. 24 N., R. 3 E., by the union of East and West forks, of which the East Fork drains the larger area and may therefore be considered the head of the main stream. The East Fork rises in the northeastern part of Butte County in the southeastern part of T. 26 N., R. 5 E., at altitude 5,800 feet above sea level, flows northwestward for 5 miles and then takes a general southwesterly course to the lower end of Butte Basin, east of Sacramento River, where it discharges into Butte Sink; length from Butte Sink to head of East Fork about 80 miles; fall in 40 miles between the head and the point where it leaves the foothills 5,300 feet. The valley is long and very narrow. The principal tributaries are West Fork, Little Butte and Dry creeks. Lassen Peak, Chico, and Marysville sheets.

Butte Creek, Little (L); rises in Butte County, in the eastern part of T. 24 N., R. 3 E., near Powellton, at altitude 3,600 feet above sea level; takes a general southwesterly course to its junction with Big Butte Creek; length, about 18 miles; fall, 3,200 feet; principal tributaries Mosquito and Middle Butte creeks. Chico sheet.

Butte Creek, Middle (R); rises in Butte County, in the eastern part of T. 23 N., R. 3 E., at altitude 2,700 feet above sea level; flows west of south about 6 miles to its junction with Little Butte Creek (tributary through Butte Creek to Butte Basin); fall, 1,700 feet. Chico sheet.

Butte Creek, West Fork (R); rises in Butte County, in the northeastern part of T. 25 N., R. 3 E., near Lomo, at altitude 3,800 feet above sea level; flows southward to junction with the East Fork of Butte Creek (tributary through Butte Creek to Butte Basin); length, 9 miles; fall, above forks, about 1,800 feet. Lassen Peak and Chico sheets.

Butte Slough; between Sutter and Butte basins, east side Sacramento River, southwest of Marysville Buttes. Through this slough Butte Basin drains to Sutter Basin. Under ordinary circumstances no water passes through Butte Slough to Sacramento River. Such discharge would occur only at times when the river falls more rapidly than the water in Butte Basin, at less than bank heights inflow would begin through Butte Slough, which is connected with Butte Basin by circuitous route through Butte Sink. Marysville sheet.

Byers Slough; Colusa Basin, west side Sacramento River, extending southwestward from a point 1 mile south of Grand Island. Sheet E, Sacramento Valley map.

Byron Creek (L); rises in Shasta County, in T. 30 N., R. 7 W., at altitude 1,800 feet above sea level; flows southeastward about 2 miles into North Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River) near Ono; fall, 1,000 feet. Red Bluff sheet.

Cabin Hollow Creek (R); rises in Butte County, 2 miles west of the head of Sycamore Creek, at altitude 1,300 feet above sea level; flows southwestward 3 miles, then southward 1½ miles into Sycamore Creek (tributary to Mud Creek and thus through Big Chico Creek to the Sacramento); fall, 1,000 feet. Chico sheet.

Cache Creek (R); rises in Lake County, in Clear Lake, of which it is the only known outlet; flows southeastward to Yolo Basin; length about 80 miles; drainage area 1,290 square miles.

The basin lies on the eastern slope of the Coast Range in Lake, Colusa, and Yolo counties, immediately south and west of Putah Creek; the principal part of the area, comprising about 824 square miles, lies in central Lake County, south of the divide between Cache Creek basin and the basin of Eel River. This tract is roughly triangular in shape and contains Clear Lake in its center. The lower part of the basin extends southeastward from Lake County to the Sacramento Valley, as a stretch about 50 miles long and 10 miles wide.

The largest and most important tributary of Cache Creek is its North Fork, which drains 250 square miles in the eastern part of Lake County. The only other important

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tributary is Bear Creek, which drains the western part of Colusa County. These creeks closely resemble each other and in summer rarely become dry. All the tributaries are torrential.

The upper part of the basin is mountainous and very rugged, some of the peaks reaching an altitude 6,000 feet above sea level, and other slopes as well as those of the lower ranges are very steep. About 5 miles below Clear Lake the creek enters its canyon into which it flows for 25 miles on an average grade of 30 feet to the mile. In some places the canyon walls are vertical cliffs 300 feet high. Below the canyon the creek enters Capay Valley, from 1 to 2 miles wide and 20 miles long, through which it winds for nearly 30 miles before it enters Sacramento Valley.

On the northern slopes of the mountains around Clear Lake are belts of fir, oak, and pine; elsewhere on the high ranges the vegetation consists of a dense growth of greasewood and chaparral. A stretch along the northern edge of the basin is included in a national forest.

Good storage sites are available in this basin. Clear Lake forms a natural reservoir which is very effective in regulating the flow of Cache Creek.

The creek furnishes exceptional opportunities for irrigation development and opportunities for water power development are also excellent. The upper part of the basin contains springs, a number of which have medicinal properties.

Gaging stations at Lower Lake (1901–1910) and at Yolo (1903–1910).

Surveys and data: Punnett's map of Mendocino and Lake counties, 1908; Sacramento Valley map; Water-Supply Paper U. S. Geol. Survey No. 45, 1901.

Cache Creek, Middle. See *Middle Creek.*

Cache Creek, North Fork (L); rises in Lake County, in the eastern part of T. 16 N., R. 9 W.; takes a general southwesterly course to its junction with Cache Creek (tributary to Yolo Basin) in the northeastern part of T. 13 N., R. 6 W. This branch, often called Cache Creek, drains the country to the north and east of Clear Lake and adds very materially to the drainage area of the creek but is much smaller than the stream from the lake; length, above junction with Cache Creek, 35 miles.

Land Office map of California, 1907; post route map of California. See also Water-Supply Paper U. S. Geol. Survey No. 45, pp. 27 to 28. On Punnett's map of Lake and Mendocino counties the stream called North Fork on the Land Office and post route maps is called Bartlett Creek.

Cache Creek Slough; Colusa Basin, Yolo County, extends southwestward from a point near the Sacramento at Sycamore Slough north to Cache Creek at Yolo. Sheet H, Sacramento Valley map.

Cache Slough; the outlet channel through which the waters of Yolo Basin enter Steamboat Slough on Sacramento River; tidal. Sheet P, Sacramento Valley map.

Camel Creek (L); rises in Tehama County, in the northwestern part of T. 24 N., R. 2 E., on the east slope of Camel Mound, at altitude 2,500 feet above sea level; flows southwestward into Pine Creek (tributary to the Sacramento); length, about 12 miles; fall, 2,200 feet. Chico sheet.

Camp Creek (R); Butte County; rises in the southern part of T. 24 N., R. 5 E., at altitude 4,500 feet above sea level; flows somewhat east of south 6 miles to junction with North Fork Feather River (tributary through Feather River to the Sacramento); fall, 3,000 feet. Bidwell Bar sheet.

Camp Creek (L); Plumas County; rises in the western part of T. 23 N., R. 11 E., at altitude 6,800 feet above sea level; flows northeastward into Poplar Creek (tributary through Middle Fork of Feather River to Feather River and the Sacramento); length, 2 miles; fall, 2,300 feet. Downieville sheet.

Campbell Creek (R); Butte County; rises in the southern part of T. 25 N., R. 3 E., at altitude 3,200 feet above sea level; flows southward 2 miles into West Fork of Butte Creek (tributary through Butte Creek to Butte Basin); fall, 500 feet. Chico sheet.

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Campbell Creek (L); Shasta County; rises in the southern part of T. 35 N., R. 3 W., on the western slope of Minnesota Mountain, at altitude 4,000 feet above sea level; flows northwestward about 4 miles into McCloud River (tributary through Pitt River to the Sacramento); fall, 3,100 feet. Redding sheet.

Canyon Creek (R); Butte County; rises in the northern part of T. 20 N., R. 5 E., at altitude 2,400 feet above sea level; flows irregularly southwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento (1 mile below Bidwell Bar; length, 6 miles; fall, 2,100 feet. Bidwell Bar sheet.

Canyon Creek (L); Eldorado County; rises in the southwestern part of T. 13 N., R. 11 E., at altitude 3,300 feet above sea level; flows in general somewhat north of west into Middle Fork of American River (tributary through North Fork of American River and American River to the Sacramento); length, about 9 miles; fall, 2,500 feet, of which about 1,000 feet occurs in 2 miles just above mouth. Placerville sheet.

Canyon Creek (L); Nevada County; rises in the western part of T. 18 N., R. 13 E., in French Lake, at altitude 6,550 feet above sea level; flows northwestward 5 miles to Bowman Lake, thence southwestward 10 miles to its junction with the South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); flows through Faucherie and Bowman lakes; drains many small lakes; dams at outlets of French, Faucherie, and Bowman lakes; fall of Canyon Creek below outlet of French Lake, 3,700 feet; fall below outlet of Bowman Lake, 2,450 feet; below Bowman Lake occupies deep canyon. Colfax sheet.

Canyon Creek (R); Placer County; rises in the northern part of T. 16 N., R. 11 E., at altitude 4,900 feet above sea level; flows southwestward 9 miles, then southeastward 1½ miles into North Fork of American River (tributary through American River to the Sacramento) 2 miles southeast of Gold Run; fall, 2,400 feet, of which 1,000 feet occurs in ½ mile at mouth. Colfax sheet.

Canyon Creek (R); Sierra County; rises on the southwestern slope of Mount Fillmore, at altitude 7,000 feet above sea level; flows in a very irregular but in general southwesterly course to its junction with North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); length, 21 miles; fall, 4,900 feet; tributaries, Little Canyon, Cars, and Rock creeks. Downieville and Bidwell Bar sheets.

Canyon Creek, Big (L); rises in Eldorado County, in the northwestern part of T. 10 N., R. 11 E., just north of Placerville, at altitude 2,200 feet above sea level; flows southwestward one-half mile and then northwestward 1½ miles into South Fork of American River (tributary through American River to the Sacramento); fall, 1,000 feet. Placerville sheet.

Canyon Creek, Little (L); rises in Sierra County, in the central part of T. 21 N., R. 10 E., on the south slope of Deadwood Peak, at altitude 6,300 feet above sea level; takes a circuitous but in general southwesterly course to its junction with Canyon Creek (tributary to North Fork of Yuba River, which flows through Middle Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); length, about 6 miles; fall, 2,300 feet. Downieville sheet.

Canyon Creek, North (L); Eldorado County; rises in the southeastern part of T. 11 N., R. 11 E., at altitude 3,200 feet above sea level; flows northwestward 3 miles into South Fork of American River (tributary through American River to the Sacramento); fall, 1,600 feet. Placerville sheet.

Canyon Creek, North (R); Plumas County; rises in Round Valley Reservoir in T. 26 N., R. 9 E., at altitude 4,480 feet above sea level; flows northward about 2 miles into Wolf Creek (tributary through Indian Creek to North Fork of Feather River and thence through Feather River to the Sacramento); fall, 900 feet. Indian Valley special map.

Canyon Creek, South (L); rises in Eldorado County, in the northeastern part of T. 10 N., R. 11 E., at altitude 2,000 feet above sea level; flows northwestward 2½ miles

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into South Fork of American River (tributary through American River to the Sacramento); fall, 1,500 feet. Placerville sheet.

Canyon Creek, South Fork (L); rises in Nevada County, in the southeastern part of T. 18 N., R. 12 E., in Island Lake, at altitude 6,900 feet above sea level; flows northward, passing through several small lakes to its junction with Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento) about halfway between Faucherie and Bowman lakes; length, 3 miles; fall, 1,000 feet. Colfax sheet.

Cape Horn Creek (L); rises in Shasta County, in the eastern part of T. 36 N., R. 1 W., at altitude 2,400 feet; flows southwestward about 4 miles to its junction with Pit River (tributary to Sacramento River); fall, 900 feet. Lassen Peak sheet.

Capell Creek (R); rises in Napa County, in the southwestern part of T. 7 N., R. 3 W.; flows northwestward into Soda Creek (tributary through Putah Creek to Yolo Basin); length, about 6 miles. Punnett's map of Napa County.

Cars Creek (L); rises in Sierra County, near the central part of T. 20 N., R. 10 E., at altitude 5,400 feet above sea level; flows west of north 2 miles into Canyon Creek (tributary to North Fork of Yuba River, which flows through Middle Fork of Yuba River to Yuba River, Feather River and the Sacramento); fall, 1,700 feet. Downieville sheet.

Cascade Creek (L); rises in Plumas County, in the northwestern part of T. 21 N., R. 8 E., on the south slope of Cammel Peak, at altitude 5,000 feet above sea level; flows westward into South Branch of Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 5 miles; fall, 1,300 feet. Bidwell Bar sheet.

Cascade Lakes; Placer County, southwestern part of T. 17 N., R. 14 E.; a group of glacial lakes lying on the north slope of Devil Peak, some connected and some having no outlet, the larger lakes discharging to streams flowing northwestward to South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); elevation, about 6,700 feet above sea level. Truckee sheet.

Castle Creek (R); rises in Shasta County, northwestern part of T. 38 N., R. 5 W., on the eastern slope of Trinity Mountains, at altitude 6,600 feet above sea level; flows somewhat south of east to its junction with Sacramento River near center of T. 38 N., R. 4 W., 3 miles southwest of Dunsmuir; length, about 8 miles; fall, 4,600 feet. Shasta sheet.

Castle Creek, Little (R); rises in southern Siskiyou County, near the center of T. 39 N., R. 4 W., on the eastern slope of Castle Rock, at altitude (approximate) 3,800 feet above sea level; flows southeastward about 4 miles to its junction with Sacramento River in Shasta County, in the northern part of T. 38 N., R. 4 W., 1 mile southwest of Dunsmuir; fall, about 1,600 feet. Shasta sheet.

Castle Lake; southern Siskiyou County, western part of T. 39 N., R. 4 W., northwest of Castle Rock; outlet, an unnamed (on the maps) stream about 5 miles long, flowing northeastward into Sacramento River in the southern part of T. 40 N., R. 4 W., 3 miles south of Sisson; elevation, 5,434 feet; fall of outlet, 2,034 feet. Shasta sheet.

Cedar Creek (L); rises in Colusa County, in the southern part of T. 17 N., R. 7 W.; flows eastward about 4 miles into Little Stony Creek (tributary through Stony Creek to Sacramento River). Punnett's map of Glenn and Colusa counties.

Cedar Creek, Placer County. See *Palisade Creek.*

Cedar Creek (R); Plumas County; rises in the southern part of T. 23 N., R. 12 E., at altitude 6,200 feet above sea level; takes a general course south of west to its junction with the Middle Fork of Feather River (tributary through Feather River to the Sacramento) opposite the mouth of Jamison Creek; length, about 2 miles; fall, 1,700 feet. Downieville sheet.

Cedar Creek (R); Shasta County; rises in the eastern part of T. 34 N., R. 1 W., on the southern slope of Round Mountain, at altitude 2,000 feet above sea level; flows

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southwestward about 6 miles into Little Cow Creek (tributary to Cow Creek and thus to the Sacramento); fall, about 800 feet. Lassen Peak and Redding sheets.

Cedar Grove Ravine Creek (L); rises in Sierra County, in the northwestern part of T. 21 N., R. 10 E., on the west slope of Table Rock, at altitude 6,200 feet above sea level; flows southeastward 3 miles into Slate Creek (tributary to North Fork of Yuba River, which flows through Middle Fork of Yuba to Yuba River and thus through Feather River to the Sacramento); fall, 1,600 feet. Downieville sheet.

Chambers Creek (R); rises in Plumas County, in the southern part of T. 25 N., R. 6 E. (altitude 6,400 feet above sea level); flows southeastward about 5 miles into North Fork of Feather River (tributary through Feather River to the Sacramento); fall, about 4,500 feet, of which 2,500 feet occurs in 1½ miles at mouth. Bidwell Bar sheet.

Chambers Ravine Creek (L); rises in Butte County, in the western part of T. 20 N., R. 4 E., on the west slope of Table Mountain, at altitude 900 feet above sea level; flows southwestward about 12 miles into Dry Creek (tributary through Butte Creek to Butte Basin); water from Chambers Ravine reaches Dry Creek only in time of flood. The channel from Chambers Ravine receives also the drainage from Coal Canyon and Beatson Hollow creeks. Chico sheet.

Charcoal Ravine Creek (L); rises in Sierra County, in the eastern part of T. 19 N., R. 11 E., at altitude 6,200 feet above sea level; flows northwestward 2 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); fall, 2,500 feet. Downieville sheet.

Charlie Creek (R); rises in Shasta County, in the western part of T. 35 N., R. 5 W., at altitude 3,800 feet above sea level; flows southeastward 4½ miles to junction with Sacramento River 1 mile south of Gregory; fall, 2,800 feet. Redding sheet.

Chatterdowen Creek (L); rises in Shasta County, in the northwestern part of T. 36 N., R. 2 W., at altitude 2,800 feet above sea level; takes a general southwesterly course to its junction with McCloud River (tributary to Pit River and thus to the Sacramento); length, about 5 miles; fall, 1,600 feet; intermittent. Redding sheet.

Chatterdowen Creek, South Fork (L); rises in Shasta County, in the western part of T. 36 N., R. 2 W., at altitude 3,000 feet above sea level; flows northwestward to Chatterdowen Creek (tributary to McCloud River and thus through Pit River to the Sacramento); length, 3 miles; fall, 1,700 feet; intermittent. Redding sheet.

Chemissal Creek (R); rises in Colusa County in the southern part of T. 14 N., R. 4 W.; flows northward to Cortina Creek, which discharges into Colusa Basin; intermittent. Sheet E, Sacramento Valley map.

Cherokee Creek (R); Butte County; rises 1 mile north of Cherokee, in T. 21 N., R. 4 E., at altitude 1,000 feet above sea level; flows northeastward 1½ miles into West Branch of Feather River (tributary through Feather River to the Sacramento); fall, 300 feet. Chico sheet.

Cherokee Creek (R); Sierra County; rises in the northeastern part of T. 19 N., R. 9 E., at altitude 5,050 feet above sea level; flows southwestward to its junction with the North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba River and Feather River to the Sacramento); length, 7 miles; fall, 2,800 feet. Downieville and Bidwell Bar sheets.

Chickahominy Slough; Yolo Basin, 3 miles north of Winters. Sheet L, Sacramento Valley map.

Chicken Ranch Slough; Sacramento County, Rancho del Paso; extends northeastward from Nigger Slough with which it is connected in times of flood. Brighton sheet.

Chico Creek, Big (L); rises in Tehama County, in the northern part of T. 26 N., R. 4 E., at altitude 5,000 feet above sea level; takes a general southwesterly course to its junction with the Sacramento about 5 miles west of Chico, in Butte County; length, about 45 miles; total fall, 4,890 feet; in the last 10 miles of its course it falls about 100

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feet; in the upper 35 miles the drainage basin is very narrow, the maximum width being about 2 miles; slopes are steep, and the stream receives many short tributaries from both sides; above Chico the channel is divided, part of the water flowing through Sandy Gulch; connected with Mud Creek by a channel slough. In times of flood Chico Creek sends some of its water across banks into Little Chico Creek and into the network of sloughs to the south; these waters do not return to the river until the basins into and through which they flow are full and force reentry into the river channel near the mouth of Feather River. Chico sheet. See also *Butte Basin and Sutter Basin*.

Chico Creek, Little (L); rises in Butte County in the southern part of T. 24 N., R. 3 E., near Berdan, at altitude 3,200 feet above sea level; flows southwestward 27 miles; discharges into upper end of Butte Basin near Dover cut-off; flows through the town of Chico; fall in 18 miles from head to point where it leaves the hills, 3,000 feet, of which 1,700 feet occurs in 5 miles at the extreme head. Chico sheet.

Chino Creek (L); rises in Butte County, in the north-central part of T. 22 N., R. 5. E., on the south slope of Big Bar Hill, at altitude 3,500 feet above sea level; flows southward 5 miles to junction with North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 3,200 feet. Bidwell Bar sheet.

Chip Creek (R); rises in Plumas County in the northeastern part of T. 25 N., R. 5 E., at altitude 6,000 feet above sea level; flows southeastward 8 miles into the North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 4,000 feet. Lassen Peak sheet.

Chipmunk Creek (L); rises in Placer County, in the northeastern part of T. 14 N., R. 13 E., at altitude 6,000 feet above sea level; flows southwestward 3 miles into Middle Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,500 feet. Truckee sheet.

Chunk Creek (R); rises in Eldorado County, in the northeastern part of T. 10 N., R. 11 E., at altitude 2,200 feet above sea level; flows southwestward 3 miles into Webber Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 1,100 feet. Placerville sheet.

Church Creek (R); rises in Sierra County, in the eastern part of T. 21 N., R. 12 E., at altitude 7,000 feet above sea level; flows westward 4 miles into Gold Lake; passes through several small lakes; fall, about 700 feet. Downieville sheet.

Churn Creek (L); rises in Shasta County, in the eastern part of T. 33 N., R. 5 W., at altitude 1,500 feet above sea level; flows southward 18 miles into Sacramento River, which it enters in the southern part of T. 31 N., R. 4 W.; fall, 1,100 feet; intermittent; many small, intermittent tributaries. Red Bluff and Redding sheets.

Claiborne Creek (L); rises in Shasta County, in western part of T. 38 N., R. 2 W., at altitude 3,200 feet above sea level; flows northwestward about 3 miles to junction with McCloud River (tributary through Pit River to the Sacramento); fall, 1,650 feet. Shasta sheet.

Clark Creek (R); rises in Shasta County, near center of T. 38 N., R. 2 E., at altitude 4,600 feet; flows southward 8 miles into Pit River (through which it is tributary to Sacramento River) near Pecks; fall, 2,100 feet, of which 1,500 feet occurs in the lower 4 miles of course. Modoc Lava Bed sheet.

Clark's Creek. See *West Valley Creek*.

Clark Slough (R); Tehama County, Saucos Rancho; a channel about 2 miles long, extending westward from Sacramento River above Plumas Rapids. Vina sheet.

Clear Creek (L); Butte County; rises in the east central part of T. 22 N., R. 3 E., at altitude 2,100 feet above sea level; flows west of south to its junction with Dry Creek (tributary through Butte Creek to Butte Basin); length, about 12 miles; fall, 1,800 feet. Chico sheet.

Clear Creek (R); Butte County; rises in the southern part of T. 25 N., R. 4 E., just south of Inskip, at altitude 4,800 feet above sea level; flows southwestward 4 miles fnto Kanaka Creek (tributary through East Fork of Butte Creek and Butte Creek to Butte Basin); fall, 1,900 feet. Chico sheet.

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Clear Creek (L); Nevada County; rises in the southern part of T. 16 N., R. 8 E., at altitude 2,300 feet above sea level; flows southwestward 2 miles, then northwestward 3 miles into Squirrel Creek (tributary through Deer Creek to Yuba River and thus through Feather River to the Sacramento) at the head of Penn Valley; fall, about 900 feet. Smartsville sheet.

Clear Creek (L); Plumas County; rises in the western part of T. 24 N., R. 8 E., on the eastern slope of Spanish Peak (altitude 7,047 feet above sea level); flows eastward about 6 miles into Rock Creek (tributary to Spanish Creek and thence through Indian Creek to North Fork of Feather River, to Feather River, and to the Sacramento); fall, about 3,300 feet, of which 2,500 feet occurs in the first 2 miles of course; many small tributaries. Bidwell Bar sheet.

Clear Creek (R); Plumas County; rises in the northwestern part of T. 25 N., R. 10 E., at altitude about 6,400 feet above sea level; flows southwestward 3½ miles into Spanish Creek (tributary to Indian Creek through North Fork of Feather River to Feather River and into the Sacramento); fall, about 3,500 feet; intermittent at head; many small intermittent tributaries. Indian Valley special map.

Clear Creek (R); Shasta County; rises in the northern part of T. 36 N., R. 6 W., at altitude 2,800 feet above sea level; flows southward along the east base of Trinity Mountains about 20 miles, then turns and flows southeastward to its junction with Sacramento River about 6 miles below Redding; length, 44 miles; fall, 4,400 feet, of which 3,000 feet occurs in about 6 miles at head; many small tributaries, Red Bluff sheet.

Clear Creek (R); Yuba County; rises in central part of T. 19 N., R. 8 E., at altitude 2,900 feet above sea level; flows southward 2 miles into Willow Creek (tributary to North Fork of Yuba River and thus through Middle Fork of Yuba, Yuba, and Feather rivers to the Sacramento); fall, 900 feet. Smartsville sheet.

Clear Creek, East Fork (L); rises in Shasta County, in the central part of T. 34 N., R. 6 W., 3,800 feet above sea level; flows southwestward into Clear Creek (tributary to Sacramento River); length, 5 miles; fall, 2,300 feet. Red Bluff sheet.

Clear Creek, South Fork (R); rises in Shasta County, in the northeast part of T. 31 N., R. 7 W., southeast of Bally Mountain, at altitude 3,000 feet above sea level; flows southeastward into Clear Creek (tributary to Sacramento River) near Piety Hill; length, 5 miles; fall, 2,100 feet. Red Bluff sheet.

Clear Lake; Lake County, central part; principal inlets Scott, Middle and Clover creeks from the west, Doba, Kelsey, and Cold creeks from the south. These creeks are torrential during the rainy season but are practically dry in summer; outlet Cache Creek to Yolo Basin.

The lake is very irregular in shape, is 20 miles long and 7 miles in maximum width, its area is 65 miles, and its elevation at mean level is 1,325 feet above sea level. The greatest depth of the principal part or main lake is 35 feet; in the lower neck are a few small areas at least 50 feet deep. The drainage area tributary to the lake comprises about 417 square miles and lies chiefly to the south and west.

Punnett's map of Mendocino and Lake counties, 1908; Water-Supply Paper U. S. Geol. Survey No. 45, 1901.

Clear Lake; Modoc County, southeastern part; 4 miles west of Eagle Peak; one inflowing stream—South Fork of Pit River; outlet, South Fork of Pit River to Pit River, a tributary of the Sacramento; elevation, 5,808 feet. Alturas sheet.

Clikapudi Creek (L); rises in Shasta County, in the north-central part of T. 33 N., R. 3 W., at altitude 1,300 feet above sea level; flows northeastward 2 miles into Pit River (tributary to Sacramento River); fall, 500 feet. Redding sheet.

Clipper Creek (L); rises in Nevada County, in the central part of T. 16 N., R. 9 E., at altitude 3,400 feet above sea level; flows somewhat south of west 4 miles into Little Greenhorn River (tributary to Bear River and thus through Feather River to the Sacramento); fall, 900 feet. Colfax sheet.

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Clipper Creek (R); rises in Placer County, in the northern part of T. 13 N., R. 9 E., at altitude 2,000 feet above sea level; flows southwestward 6 miles into North Fork of American River (tributary through American River to the Sacramento) about 3 miles northeast of Auburn; fall, 1,400 feet. Placerville and Sacramento sheets.

Clough Creek (L); rises in Shasta County, in the extreme western part of T. 32 N., R. 3 W., 1½ miles west of Bellavista, at altitude 650 feet above sea level; flows west of south 3½ miles into Stillwater Creek (tributary to Sacramento River); fall, about 100 feet; intermittent. Redding sheet.

Clough Gulch Creek (L); rises in Shasta County, in the western part of T. 31 N., R. 1 W., at altitude 1,600 feet above sea level; flows southwestward 2 miles, then northwestward 3 miles into South Fork of Cow Creek (tributary through Cow Creek to Sacramento River); fall, about 900 feet; intermittent. Redding sheet.

Clover Creek (L); rises in Lake County in the southeastern part of T. 16 N., R. 9 W.; flows south of west about 6 miles into Middle [Cache] Creek (tributary to Cache Creek and thus to Yolo Basin) at upper lake. Punnett's map of Lake County.

Clover Creek (R); rises in Shasta County, in the northeastern part of T. 33 N., R. 1 E., at altitude 3,000 feet above sea level; flows irregularly southwestward into Cow Creek (tributary to Sacramento River); length, about 28 miles; fall, 2,450 feet, of which 1,000 feet occurs in the first 5 miles of course. Lassen Peak, Red Bluff, and Redding sheets.

Coal Canyon Creek (R); rises in Butte County, in the northwestern part of T. 20 N., R. 4 E., at altitude 1,300 feet above sea level; flows south of west 3½ miles, then west of south 3 miles into Chambers Ravine Creek (tributary through Dry Creek to Butte Basin); fall, 1,100 feet, of which 900 feet occurs in about 3 miles at head. Chico sheet.

Cogswell Creek (R); rises in Plumas County in the north central part of T. 23 N., R. 12 E., at altitude 6,200 feet above sea level; flows south of west 2 miles into Jackson Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento) 1 mile west of Cromberg; fall, 1,800 feet. Downieville sheet.

Cold Creek (L); rises in Butte County, in the eastern part of T. 24 N., R. 4 E., at altitude 4,000 feet above sea level; flows southward into West Branch of Feather River (tributary to North Fork of Feather River and thence through Feather River to the Sacramento); length, 2 miles; fall, 1,000 feet. Chico sheet.

Cold Creek (L); rises in Siskiyou County, on the east slope of Mount Shasta, at altitude 7,400 feet above sea level; flows southeastward; discharges flood waters to Ash Creek (tributary through springs issuing from lava beds to McCloud River, which flows into the Pit and thus into the Sacramento), but most of its water sinks into the lava beds to join the underground drainage tributary to the McCloud. Shasta sheet.

Cold Fork of Cottonwood Creek. See *Cottonwood Creek, Cold Fork.*

Coldwater Creek (L); rises in Plumas County, in the south-central part of T. 23 N., R. 7 E., on the south slope of Grizzly Hill, at altitude 5,700 feet above sea level; flows southwestward 3 miles, then northwestward 1 mile into Coquette Creek (tributary through Little North Fork of Feather River to Middle Fork of Feather River, and thus through Feather River to the Sacramento); fall, 1,000 feet. Bidwell Bar sheet.

Concow Reservoir. See *Spring Valley Reservoir.*

Colusa Basin; west side of Sacramento River, between mouth of Stony Creek and Grafton (Kings Landing); formed by a broad ridge 10 to 20 feet high which has been built up by Cache Creek across the west side of the valley from the foothills to the river. Cache Creek at present flows on the south slope of this ridge and discharges its water into the upper end of Yola Basin. Colusa Basin has no outlet except into the river to which it can discharge no water except at an elevation as great as that of the water in the river at Grafton. The basin receives the drainage from the entire Coast Range foothill region between the watersheds of Cache and Stony creeks and also all the water escaping from the channel of the Sacramento across its west bank at points between Stony Creek and Grafton.

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In times of general flood when the water in this basin stands as high as the water in the river at Knights Landing, it becomes closely connected with Sutter Basin by water across the west and east banks of the river, and the two inland seas are practically one, the stage of water depending on the stage of the river at and below Grafton. A line of levees from Grafton up the west side of the river to a point near Stony Creek has been partly successful in preventing the spread of the water into the Colusa Basin, but waters from the Coast Range as well as flood waters from the river may cause general submersion of lands in the southern part of Colusa Basin. Before the waters were confined by levees, a general river flood converted the entire west side trough, from a point west of Princeton to the ridge at Grafton, into a narrow sea, nearly 50 miles long and 2 to 7 miles wide. The waters in this sea were all slowly moving from north to south and reentered Sacramento River through Lower Sycamore Slough at Grafton or across river banks. The amount of water which may have been spread over the entire west-side plain at a time of general flood before levees were built may have reached 45,000,000,000 cubic feet.

Several sloughs, natural high-water relief channels, lead westward from Sacramento River into Colusa Basin, and each of these sloughs has built up its banks above the general surface of the country. By reason of this building up of low, flat ridges into the basin from the river bank, which is itself 10 to 20 feet higher than the general surface of the bottom of the basin, the continuous slope of the bottom from north to south has been to some extent interrupted and a number of pockets have been formed which lie between or above the sloughs. Upper Sycamore Slough has in this way extended its course nearly across the west side trough and formed Colusa upper basin—Mormon Basin—which except in times of general flood is connected with the lower or main portion of Colusa Basin only by a narrow throat between Sycamore Slough and the higher west-side plain.

Sheets A to I, Sacramento Valley map. Report of Examining Commissioners on Rivers and Harbors to the Governor of California (C. T. Reed, C. E. Grunsky, J. J. Crawford, commissioners), Sacramento, 1890, pp. 64, 65.

Concow Creek (L); rises in Butte County, in the south central part of T. 23 N., R. 4 E., at altitude 3,000 feet above sea level; flows southwestward about 8 miles, passing through Spring Valley Reservoir to its junction with West Branch Feather River (tributary to North Fork of Feather River and thence through Feather River to the Sacramento); fall to head, 1,800 feet; fall in 4 miles below Spring Valley Reservoir 800 feet. The name Concow is also applied to a small creek flowing from the extreme southeastern part of T. 23 N., R. 4 E., into Canyon Creek just below its entrance into the reservoir. This tributary creek is about 3 miles long and falls 1,000 feet. Bidwell Bar and Chico sheets.

Cook's Canyon Creek (R); rises in Plumas County near the center of T. 27 N., R. 10 E., at altitude 5,000 feet above sea level; flows southward about 8 miles, joins Lights Creek (tributary through Indian Creek to North Fork of Feather River and thus through Feather River to the Sacramento) in the swampy tract at the lower end of the north arm of Indian Valley; fall about 1,000 feet. Honey Lake sheet.

Coon Creek (L); rises in Placer County, in the northern part of T. 13 N., R. 7 E., 3 miles northwest of Auburn, at altitude 1,100 feet above sea level; flows northeastward 7 miles, then southwestward into American Basin, north of Murphy Lake; fall in the 7 miles through the foothills, 700 feet; intermittent; principal tributaries, Dry Creek and Doty Creek. Placerville sheet.

Coquette Creek (L); rises in Plumas County, in the southwestern part of T. 23 N., R. 7 E., on the south slope of Grizzly Hill, at altitude 5,500 feet; flows southwestward into Little North Fork of Feather River (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento; length, 2 miles; fall, 1,500 feet; tributary, Coldwater Creek. Bidwell Bar sheet.

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Corbiere Slough; Colusa Basin, west side of Sacramento River extending southward from Dry Slough (an offshoot of Upper Sycamore Slough) 2 miles south of Sycamore. Sheet E, Sacramento Valley map.

Corral Lake; Sacramento County, Rancho del Paso, one-half mile north of American River, and 2½ miles north of east of Sacramento. Brighton sheet.

Cortina Creek (R); rises in Colusa County in the southeastern part of T. 13 N., R. 4 W., flows northwestward 6 miles, then north of east about 7 miles, and discharges into Colusa Basin in T. 14 N., R. 2 W., west of Sycamore Slough; intermittent. Sheet E, Sacramento Valley map.

Cortina Creek, Old (R); rises in Colusa County in the southeastern part of T. 14 N., R. 3 W., at altitude about 185 feet above sea level; flows northeastward and discharges into Colusa Basin west of Powell Slough; intermittent. Sheet E, Sacramento Valley map.

Cortina Creek, South Fork (R); rises in Colusa County in the southwestern part of T. 13 N., R. 4 W.; flows north about 3 miles to Cortina Creek, which discharges into Colusa Basin; intermittent. Sheet E, Sacramento Valley map.

Cottonwood Creek (R); Modoc County; rises about 8 miles northeast of Adin, at altitude (approximate) 5,800 feet above sea level; flows southeastward 8 miles, then southwestward 3 miles, and unites with Ash Creek (tributary to Pit River and thus to the Sacramento) at the lower end of Ash Creek valley; fall, about 900 feet. Alturas sheet.

Cottonwood Creek (L); Modoc County, northeastern part; rises on the western slope of Warner Mountains, at altitude 6,000 feet above sea level; flows northwestward 4 miles into Goose Lake, which at exceptionally high stages may be tributary to the North Fork of Pit River and thus through Pit River to the Sacramento; fall, 1,200 feet. Alturas sheet.

Cottonwood Creek (R); Shasta County; rises in the western part of T. 33 N., R. 5 W., at altitude 2,000 feet above sea level; flows southeastward 2½ miles into Sacramento River; fall, 1,450 feet (approximately); intermittent. Redding sheet.

Cottonwood Creek (R); Shasta and Tehama counties, between which it forms the boundary; formed by junction of Middle and North forks, of which Middle Fork may be considered the continuation of the main stream.

Middle Fork rises in the southeastern part of T. 30 N., R. 10 W., on the eastern slope of Trinity Mountains, and winds eastward; it is about 30 miles long, falls 5,900 feet (from the crest of the range), and drains 261 square miles; it joins the North Fork (q. v.) a short distance below Gas Point.

Below the forks the Cottonwood flows eastward, discharging into the Sacramento about 5 miles east of the town of Cottonwood, opposite the mouth of Battle Creek; measured at the mouth of the creek, the drainage area comprises 929 square miles; about two thirds of the area is more than 1,000 feet above sea level. Below the North Fork the principal tributary is the South Fork.

Precipitation in the basin of the Cottonwood ranges from 25 inches in the lower part to more than 50 inches along the crest of the Coast Range.

Gaging station on the North Fork at Ono, 1907–1909.

Red Bluff sheet.

Cottonwood Creek (R); Yolo County; rises in the eastern part of T. 19 N., R. 2 W.; flows northeastward and discharges to Yolo Basin through Cottonwood Slough. Punnett's map of Yolo County; sheets I and K, Sacramento Valley map.

Cottonwood Creek, Cold Fork (L); rises in Tehama County, in the southeastern part of T. 27 N., R. 10 W., on the east slope of North Yolla Bolly Mountain, at altitude 6,000 feet above sea level; flows in a general easterly direction about 22 miles to its junction with the South Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River); fall, 5,200 feet. Red Bluff sheet.

Cottonwood Creek, Middle Fork. See *Cottonwood Creek.*

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Cottonwood Creek, North Fork (L); rises in Shasta County, in the southwestern part of T. 32 N., R. 7 W., on the east slope of Bully Choop Mountain, at altitude 5,000 feet above sea level; flows very irregularly southeastward, and near Gas Point unites with the Middle Fork to form Cottonwood Creek (tributary to Sacramento River); length, 20 miles; fall from source to mouth of Middle Fork, about 4,300 feet; drainage area, 112 square miles; principal tributaries, Jerusalem and Eagle creeks and Roaring River; gaging station near Ono. Red Bluff sheet.

Cottonwood Creek, South Fork (R); rises in Tehama County, in the eastern part of T. 27 N., R. 10 W., on the south slope of North Yolla Bolly Mountain, at altitude 5,000 above sea level; flows southeastward about 10 miles, then northeastward 35 miles to its junction with Cottonwood Creek (tributary to Sacramento River) a few miles west of the town of Cottonwood; drainage area, 395 square miles; fall, 4,600 feet; principal tributaries, Cold Fork Cottonwood Creek and Salt Creek. Red Bluff sheet.

Cow Creek (L); formed in Shasta County, in the western part of T. 31 N., R. 2 W., at altitude 600 feet above sea level, by the union of Old Cow [1] and South Cow creeks. Old Cow Creek, which may be considered the continuation of the main stream, rises in the northeastern part of T. 32 N., R. 2 E., on the west slope of Crater Peak, at altitude 4,700 feet above sea level; flows northwestward about 3 miles, then takes a general southwesterly course to its junction with South Cow Creek 3 miles east of Millville. From the forks Cow Creek flows northwestward about 6 miles, then southward 7 miles to junction with Sacramento River; length, from mouth to head of Old Cow, about 46 miles; total fall, 4,350 feet; length of Old Cow Creek above South Cow, 28 miles, in which distance it falls 4,100 feet, of which 2,000 feet occurs in 4 miles at the head of the stream and 1,000 feet more in the next 8 miles below. Lassen Peak, Red Bluff, and Redding sheets.

Cow Creek, Little (R); rises in Shasta County, in the southeastern part of T. 34 N., R. 1 E., about 3,600 feet above sea level; flows westward to a point near Furnaceville, then southwestward to junction with Cow Creek (tributary to Sacramento River) 1½ miles below Palocedro; length, about 30 miles; fall, 3,050 feet, of which 2,200 feet occurs in about 8 miles at head of stream; many small intermittent tributaries. Lassen Peak, Red Bluff, and Redding sheets.

Cow Creek, South Fork (L); rises in Shasta County, in the northwestern part of T. 32 N., R. 3 E., on the north slope of Latur Butte, at altitude 5,100 feet above sea level; flows southwestward and then westward to the western part of T. 31 N., R. 2 W., where it unites with Old Cow Creek to form Cow Creek (tributary to Sacramento River); length, 27 miles; fall, 4,500 feet, of which more than 3,000 feet occurs in the first half of course. Lassen Peak, Red Bluff, and Redding sheets.

Cox Creek (R); rises in Yuba County in the northern part of T. 15 N., R. 6 E., at altitude 800 feet above sea level; flows southward 5 miles into Dry Creek (tributary to Feather River) at Cabbage Patch; fall, 500 feet. Smartsville sheet.

Coyote Creek (L); rises in Lassen County, in the southern part of T. 36 N., R. 9 E., at altitude (approximate) 5,500 feet above sea level; flows irregularly westward through Dixie Valley to the eastern part of T. 35 N., R. 7 E., where it turns and flows northwestward to its junction with Pit River (tributary to the Sacramento) 10 miles southeast of Pittville; length, about 18 miles; fall, 1,800 feet. On Lassen Peak sheet the lower part of this creek—below Dixie Valley—is called Horse Creek.

Coyote Creek (L); Placer County; rises in the central part of T. 14 N., R. 9 E., at altitude 2,400 feet above sea level; flows southwestward 3 miles, then northwestward 1 mile into Bear River (tributary through Feather River to the Sacramento); fall, 900 feet. Colfax and Smartsville sheets.

Coyote Creek, (R); Tehama County; rises in the western part of La Barranca Colorada Rancho, at altitude about 400 feet above sea level; flows somewhat south of east 10 miles into Sacramento River; fall, 200 feet; intermittent. Tehama sheet.

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[1] Called North Fork of Cow Creek on Red Bluff sheet and on Denny's map of Shasta County.

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Craig Creek (L); Tehama County, Rio de los Berrendos; one of several channels through which Antelope Creek discharges into the Sacramento; it leaves Antelope Creek just above the mouth of Little Antelope, flows somewhat west of south 1½ miles, and enters Sacramento River opposite Blackberry Island; fall, about 40 feet. Tehama sheet.

Crooked Lake; Nevada County, eastern part of T. 18 N., R. 12 E.; inlet South Fork of Canyon Creek, which flows through it to its junction with Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); elevation above sea level, 6,700 feet; below Island Lake, 100 feet. Colfax sheet.

Crow Creek (L); rises in Shasta County, in the southeast part of T. 30 N., R. 7 W., at altitude 800 feet above sea level; flows southeastward 6 miles into Roaring River (tributary to North Fork of Cottonwood Creek and thus through Cottonwood Creek to the Sacramento); fall, about 100 feet; tributary, Squaw Creek. Red Bluff sheet.

Crumbo Lake; Shasta County, southern part of T. 30 N., R. 4 E.; outlet, Mill Creek to Sacramento River; elevation, 7,500 feet. Lassen Peak sheet.

Crystal Lake; Nevada County, eastern part of T. 17 N., R. 12 E.; no outlet mapped, but near-by streams flow northward to South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation, 5,800 feet. Colfax sheet.

Crystal Lake; Plumas County, northwestern part of T. 25 N., R. 10 E., outlet a stream 1¾ miles long, flowing northward into Houghs Creek (tributary to Indian River and thence through North Fork of Feather River to Feather River and to the Sacramento); elevation, 6,650 feet. Indian Valley special map.

Culbertson Lake; Nevada County, T. 18 N., R. 12 E.; 1 inlet; outlet, a stream half a mile long flowing northwestward into Texas Creek (tributary to Canyon Creek which flows through South Fork of Yuba River, through Yuba and Feather rivers to the Sacramento); elevation, 6,750 feet; dammed at outlet; fall of outlet above Texas Creek, about 200 feet. Colfax sheet.

Curry Creek (L); rises in Placer County in the southeastern part of T. 11 N., R. 5 E., at altitude 120 feet above sea level; flows southwestward 1½ miles, then very irregularly northwestward 8 miles and discharges into American Basin; fall, 100 feet; intermittent; channel tortuous. Roseville, Pleasant Grove, and Vernon sheets.

Curtis Ravine Creek (R); rises in Plumas County in the southwestern part of T. 26 N., R. 9 E., at altitude 5,000 feet above sea level; flows southeastward 2 miles into Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 1,800 feet; intermittent. Indian Valley special map.

Dark Canyon Creek (L); Butte County; rises in the southeast part of T. 22 N., R. 4 E., at altitude 2,100 feet above sea level; flows irregularly southward into West Branch of Feather River (tributary to North Fork of Feather River and thus through Feather River to the Sacramento); length, about 5 miles; fall, 1,500 feet. Bidwell Bar and Chico sheets.

Dark Canyon Creek (R); Eldorado County; rises in the northwestern part of T. 11 N., R. 12 E., at altitude 3,400 feet above sea level; flows southeastward 1 mile into Slab Creek (tributary through South Fork of American River to American River and the Sacramento); fall, 1,200 feet. Placerville sheet.

Dark Canyon Creek (R); Placer County; rises in the western part of T. 15 N., R. 12 E., at altitude 4,900 feet above sea level; flows southward 2½ miles into North Fork of Middle Fork of American River (tributary through Middle Fork of American River to North Fork of American River and thus through American River to the Sacramento); fall 1,700 feet. Colfax sheet.

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Date Creek (L); rises in Butte County, in the south-central part of T. 18 N., R. 5 E., at altitude 1,100 feet above sea level; flows southwestward into South Honcut Creek (tributary through Honcut Creek to Feather River and thus to the Sacramento); length, 10 miles; fall, 1,000 feet. Smartsville and Marysville sheets.

Davis Creek (L); rises in the eastern part of Modoc County, on the western slope of Warner Mountains, at altitude 6,000 feet above sea level; flows irregularly northwestward into Goose Lake, which at exceptionally high stages may discharge into North Fork of Pit River and thus through Pit River into the Sacramento; length, about 8 miles; fall, 1,200 feet. Alturas sheet.

Davis Creek (R); rises in Yolo County in the southeastern part of T. 12 N., R. 5 W.; flows northward 6½ miles into Cache Creek (tributary to Yolo Basin) 2 miles west of the mouth of Bear Creek; carries no water except during the rainy season. Water-Supply Paper U. S. Geol. Survey No. 45, 1901, map of Cache Creek basin (Pl. I), and p. 27.

Dead Mans Lake; Sacramento County, Rancho del Paso, 1 mile east of north of Sacramento, and one-half mile north of American River; marshy. Brighton sheet.

Dead Mans Lake; Sierra County, northwestern part of T. 20 N., R. 13 E., one-half mile north of Dead Mans Peak; outlet stream about three-fourth mile long flowing northwestward into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Feather River and thus to the Sacramento); elevation, 6,800 feet above sea level; fall of outlet, 1,000 feet. Downieville sheet.

Deadwood Creek (L); Butte County; rises in the southern part of T. 22 N., R. 4 E., at altitude 2,500 feet above sea level; flows south of west 2 miles into Canyon Creek (tributary to West Branch of Feather River, which flows to North Fork of Feather River and thus through Feather River to the Sacramento); fall, 1,100 feet. Chico sheet.

Deadwood Creek (R); Yuba County; rises in the central part of T. 20 N., R. 8 E., near North Star House, at altitude 4,000 feet above sea level; flows southward 5 miles into North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 2,000 feet. Bidwell Bar sheet.

Dean Valley Reservoir; Plumas County, northwestern part of T. 23 N., R. 9 E. on Rock Creek (tributary to Spanish Creek and thence through Indian Creek to the North Fork of Feather River, to Feather River, and to the Sacramento); elevation, 4,300 feet above sea level. Bidwell Bar sheet.. Not shown on Punnett's map of Plumas County.

Deep Canyon Creek (L); Eldorado County; rises in the northwestern part of T. 12 N., R. 12 E., at altitude 4,000 feet above sea level; flows northward 2 miles into Pilot Creek (tributary through Rubicon River to Middle Fork of American River and thus through North Fork of American and American rivers to the Sacramento); fall, 1,000 feet. Placerville sheet.

Deep Canyon Creek (L); Placer County; rises in the central part of T. 15 N., R. 13 E., on the west slope of Duncan Peak, at altitude 6,500 feet above sea level; flows southwestward 4 miles then northwestward 1½ miles into North Fork of Middle Fork of American River (tributary through Middle Fork of American to North Fork of American and thus through American River to the Sacramento); fall, 3,000 feet. Colfax sheet.

Deephaven Gulch Creek (R); rises in Tehama County, in the eastern part of T. 27 N., R. 2 W., 1,000 feet above sea level; flows north of west 1½ miles, then southward 2 miles into Little Antelope Creek (tributary to Antelope Creek and thus to the Sacramento); fall, 610 feet; intermittent. Tehama sheet.

Deer Creek (L); Eldorado County; rises in the north central part of T. 13 N., R. 14 E., at altitude 5,900 feet above sea level; flows southwestward 3 miles into Rubicon River (tributary through Middle Fork of American River to North Fork of

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American River and thus through American River to the Sacramento); fall, 1,900 feet. Truckee and Pyramid Peak sheets.

Deer Creek (L); Nevada County; formed in the southwestern part of T. 17 N., R. 10 E., by union of North and South forks. The North Fork rises in the western part of T. 17 N., R. 11 E., at altitude 4,400 feet above sea level, and flows somewhat south of west; the South Fork rises in the southwestern part of T. 17 N., R. 11 E., 1 mile south of the head of the North Fork, at altitude 4,500 feet above sea level and flows westward. Each fork is about 5 miles long and falls 1,300 feet above the junction. Below the forks Deer Creek takes a general course somewhat south of west to its junction with Yuba River (tributary through Feather River to the Sacramento); length, 27 miles; fall between Yuba and the head of North Fork, about 4,200 feet, of which 2,000 feet occurs in the 12 miles east of Nevada City; total fall is 4,200 feet. Colfax and Smartsville sheets.

Deer Creek (R); Plumas County; rises in the southern part of T. 24 N., R. 9 E., at altitude 5,500 feet above sea level; flows northwestward 2½ miles into Rock Creek (tributary to Spanish Fork and thence through Indian Creek to the North Fork of Feather River to Feather River and into the Sacramento); total fall, 1,100 feet. Downieville and Bidwell Bar sheets.

Deer Creek (L); Sierra County; rises in the western part of T. 20 N., R. 13 E., at altitude 7,500 feet above sea level; flows irregularly northwestward into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River and Yuba River to Feather River and thus to the Sacramento); length 5 miles; fall 1,800 feet. Downieville sheet.

Deer Creek (L); Tehama County; rises in the southwestern part of T. 29 N., R. 5 E., about 4,900 feet above sea level; flows southeastward 4 miles, then takes a general southwesterly course to its junction with the Sacramento in Rio de los Molinos Rancho, 1¼ miles west of Vina; length, about 50 miles; total fall, 4,720 feet; many small unnamed tributaries. Lassen Peak and Vina sheets.

Deer Creek, Little (L); rises in Nevada County in the central part of T. 16 N., R. 9 E., at altitude 3,400 feet above sea level; flows north of west to its junction with Deer Creek (tributary through Yuba River to Feather River and thus to the Sacramento) at Nevada City; length, 4 miles; fall, 1,000 feet. Colfax and Smartsville sheets.

Deer Flat Creek (L); rises in Shasta County, near the center of T. 31 N., R. 3 E., about 6,000 feet above sea level; flows westward 8 miles into the North Fork of Battle Creek (tributary through Battle Creek to the Sacramento); fall, about 2,000 feet; principal tributary, Manzanita Creek from Manzanita Lake. Lassen Peak sheet.

Deer Lake; Sierra County, southwestern part of T. 21 N., R. 12 E.; outlet a stream 2 miles long, flowing eastward to the stream connecting Lower Salmon Lake with the North Fork of the North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); elevation, 7,050 feet; fall of outlet, 900 feet. Downieville sheet.

Dekkas Creek (R); rises in Shasta County, in the eastern part of T. 35 N., R. 3 W., on the south slope of Salt Creek Mountain, at altitude 3,500 feet above sea level; flows southwestward 1 mile, then northwestward about 3 miles into McCloud River (tributary through Pit River to the Sacramento); fall, 2,550 feet. Redding sheet.

Delta Lake; southern part of Modoc County, 6 miles northwest of South Fork (Pit River) Peak; 2 small inlets; no outlet; elevation, approximate, 5,800 feet. Alturas sheet.

Devils Canyon Creek (L); rises in Placer County in the southeastern part of T. 14 N., R. 10 E., near Forest Hill, at altitude 2,900 feet above sea level; flows northwestward 3½ miles into Shirttail Canyon Creek (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,800 feet. Colfax sheet.

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Diamond Creek (L); rises in Nevada County in eastern part of T. 17 N., R. 11 E., at altitude 4,900 feet above sea level; flows northwestward 3 miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 1,900 feet. Colfax sheet.

Didallas Creek (R); rises in Shasta County, in the southeastern part of T. 35 N., R. 3 W., on the east slope of Minnesota Mountain, 2,500 feet above sea level; flows southeastward 3 miles into Squaw Creek (tributary to Pit River and thus to the Sacramento); fall, 1,500 feet. Redding sheet.

Dibble Creek (R); rises in Tehama County, in the northwestern part of T. 27 N., R. 5 W., at altitude 1,000 feet above sea level; flows eastward 10 miles, then southeastward 4 miles to junction with Sacramento River 1 mile above Red Bluff; fall, 700 feet. Red Bluff and Tehama sheets.

Digger Creek (L); rises in Shasta and Tehama counties, in T. 30 N., R. 3 E., at altitude 6,000 feet above sea level; flows westward along the Shasta-Tehama county boundary 18 miles to junction with North Fork of Battle Creek (tributary through Battle Creek to Sacramento River); fall, 4,700 feet, of which 3,000 feet occurs in about 5 miles at head. Lassen Peak sheet.

Dixie Creek (R); rises in Plumas County in the central part of T. 26 N., R. 9 E., one-half mile east of the southern end of Round Valley Reservoir, at altitude 4,500 feet above sea level; flows southward 1½ miles into Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 1,000 feet. Indian Valley special map.

Dixie Creek (R); rises in Plumas County, in the western part of T. 24 N., R. 15 E., on the west slope of Dixie Mountain, at altitude 7,000 feet above sea level; flows irregularly northwestward about 8 miles (passing through Dixie Valley), southwestward 3 miles, then somewhat north of west 2 miles to junction with Red Clover Creek (tributary through Indian Creek to North Fork of Feather River, and thus through Feather River to the Sacramento) in Red Clover Valley; fall, about 2,500 feet. Sierraville sheet.

Doba Creek (R); rises in Lake County in the northern part of T. 12 N., R. 9 W., on the eastern slope of the Cascade Range; flows southeastward 3 miles, then east of north 8 miles into Clear Lake (outlet Cache Creek to Yolo Basin) 3 miles southeast of Lakeport. Punnett's map of Lake County.

Dobbins Creek (R); rises in Yuba County in the northeastern part of T. 18 N., R. 7 E., at altitude 2,500 feet above sea level; flows southward 8 miles into Middle Fork of Yuba River (tributary through Yuba to Feather River and thus to the Sacramento); fall, 1,900 feet. Smartsville sheet.

Dodge Creek (R); rises in Shasta County, in the southern part of T. 35 N., R. 7 W., on the east slope of Trinity Mountains, at altitude 3,500 feet above sea level; flows southeastward into Clear Creek (tributary to Sacramento River); length, 3 miles; fall, 1,700 feet. Red Bluff sheet.

Dog Creek (R); rises in Shasta County, in the southern part of T. 36 N., R. 6 W.; flows irregularly eastward to its junction with Sacramento River at Delta, in T. 36 N., R. 5 W.; length, about 6 miles; fall, approximately 2,000 feet; principal tributary, Middle Fork. Red Bluff and Redding sheets.

Dog Creek, Middle Fork (L); rises in Shasta County, in the western part of T. 35 N., R. 5 W., on the eastern slope of Trinity Mountains, at altitude (approximate) 3,500 feet above sea level; flows northward to its junction with Dog Creek, a tributary of the Sacramento; about 2 miles long; fall, 2,000 feet; intermittent at head and receives many very small intermittent tributaries. Redding sheet.

Dogwood Creek (L); rises in Plumas County in the western part of T. 22 N., R. 9 E., on the western slope of Fowler Peak, at altitude 5,500 feet above sea level; flows northwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 3½ miles; fall, 2,600 feet. Bidwell Bar sheet.

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Doney Creek (R); rises in Shasta County, in the northern part of T. 35 N., R. 5 W., at altitude 3,000 feet above sea level; flows southeastward 3½ miles to its junction with Sacramento River at Gregory; fall, about 2,000 feet. Redding sheet.

Doty Creek (L); rises in Placer County in the northeastern part of T. 12 N., R. 7 E., 1 mile north of Ophir, at altitude 1,000 feet above sea level; flows northwestward 6 miles, then westward 6 miles into Coon Creek which flows into American Basin; fall, about 800 feet, of which 500 feet occurs in 3 miles at head. Placerville sheet. See also Lincoln sheet.

Dry Creek (L); Butte County; rises in the southeastern part of T. 22 N., R. 3 E., at altitude 1,700 feet above sea level; flows almost due south 7 miles, southwestward 8 miles, then in general southwestward to its junction with Butte Creek in Butte Basin, northwest of Marysville Buttes; as it leaves the foothills near Cherokee flows in many interlacing channels; intermittent below hills; principal tributary Clear Creek; called Table Mountain Creek on Land Office map. Chico and Marysville sheets.

Dry Creek (L); Eldorado County; rises in the southern part of T. 10 N., R. 10 E., near El Dorado, at altitude 1,500 feet above sea level; flows northwestward 6 miles into Webber Creek (tributary through South Fork American River to American River and thus to the Sacramento); fall, 500 feet. Placerville sheet.

Dry Creek (R); Nevada County; rises in the southeastern part of T. 14 N., R. 8 E., at altitude 1,800 feet above sea level; flows southwestward into Bear River (tributary through Feather River to the Sacramento); fall, 700 feet. Smartsville sheet.

Dry Creek (L); Nevada County; rises in the western part of T. 15 N., R. 8 E., 2 miles west of Forest Spring, at altitude 2,100 feet above sea level; flows very irregularly southwestward and discharges into a basin lying north of Bear River and south of Plumas Lake; emerges from the foothills near Spenceville. Except in times of flood its lower channels are dry. Principal tributaries Indian Spring, Little Dry and Cox creeks. Smartsville and Marysville sheets; see also Wheatland, Ostrom, and Nicolaus sheets.

Dry Creek (R); Placer County; rises in the eastern part of T. 13 N., R. 7 E., where it is formed by the junction of its North and South forks. The North Fork rises in the eastern part of T. 13 N., R. 8 E., 1½ miles northwest of Clipper Gap, at altitude 1,700 feet above sea level and flows west and south of west. The South Fork rises 1 mile northeast of Clipper Gap in T. 13 N., R. 9 E., at altitude 2,000 feet above sea level, flows southwestward 3 miles, then north of west to its junction with the North Fork. From this junction Dry Creek flows westward into Coon Creek which discharges into American Basin. Fall of the North Fork above the junction, 800 feet; fall of South Fork above the junction, 1,100 feet; intermittent. Placerville sheet.

Dry Creek, Placer and Sacramento counties. See *Linda Creek*.

Dry Creek (R); Shasta County; rises in the western part of T. 33 N., R. 3 W., on the east slope of Bear Mountain, at altitude about 900 feet above sea level; flows southward 6 miles into Little Cow Creek (tributary to Cow Creek and thus to the Sacramento); fall, 400 feet; intermittent. Redding sheet.

Dry Creek (L); Tehama County; rises in the southern part of T. 28 N., R. 9 W., at altitude 3,000 feet above sea level; flows eastward about 15 miles into Salt Creek (tributary to South Fork of Cottonwood Creek and thus through Cottonwood Creek to the Sacramento); fall, 2,300 feet. Red Bluff sheet.

Dry Creek (R); Yuba County; rises in the southeastern part of T. 19 N., R. 6 E., at altitude 2,200 feet above sea level; formed by junction of New York and Slate creeks; takes a very irregular but in general southwesterly course to its junction with Yuba River (tributary through Feather River to the Sacramento) near Browns Valley; length, 22 miles; fall, 2,100 feet; principal tributaries Indiana and Willow Glen creeks. Smartsville sheet.

Dry Creek, Little (L); Butte County; rises in the central part of T. 22 N., R. 3 E., near Paradise, at altitude 1,800 feet above sea level; flows west of south about 12

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miles; sinks before reaching Butte Creek; intermittent; fall, 1,600 feet. Chico sheet.

Dry Creek, Little (R); Nevada County; rises in the northeastern part of T. 15 N., R. 6 E., at altitude 1,400 feet above sea level; flows southward 5 miles into Dry Creek (tributary through Feather River to the Sacramento) at Spencerville; fall, 1,000 feet. Smartsville sheet.

Dry Creek, North and South forks. See *Dry Creek.*

Dry Slough; Colusa County, west side of Sacramento River extending southward from Sycamore Slough near Sycamore. Sheet E, Sacramento Valley map.

Dry Slough; a tributary of Willow Slough in Yolo Basin, joins Willow Slough about 4 miles northwest of Davisville. Sheet L, Sacramento Valley map.

Duck Slough; a channel leading from the south end of Big Lake through Yolo Basin to Miner Slough; tidal. Sheet M, Sacramento Valley map.

Dulzura Lake. See *Sereno Lake.*

Duncan Creek (R); rises in Placer County in the northeastern part of T. 15 N., R. 14 E., at altitude 7,000 feet above sea level; flows southeastward 12 miles into Middle Fork of American River (tributary to North Fork of American River and thus through American River to the Sacramento); fall, 3,000 feet. Truckee sheet.

Duncan Creek (L); Shasta County; formed by union of West, Middle, and East forks in the central part of T. 30 N., R. 8 W. The Middle Fork, which may be considered the continuation of the main stream, rises in the southwestern part of T. 31 N., R. 8 W., on the east slope of Bully Choop Mountains, about 4,500 feet above sea level, and flows southward, uniting with the East Fork; below the forks the creek flows southward into Middle Fork of Cottonwood Creek (tributary through Cottonwood Creek to the Sacramento) at Parks; length, to head of Middle Fork, about 9 miles; fall, 3,400 feet. Red Bluff sheet.

Duncan Creek, East Fork (L); Shasta County; rises in the southern part of T. 31 N., R. 8 W., on the east slope of Bully Choop Mountains, at altitude 3,800 feet above sea level; flows southward about 5 miles into Duncan Creek (tributary to Middle Fork of Cottonwood Creek and thus through Cottonwood Creek to the Sacramento) half a mile below the junction of the West and Middle forks; fall, about 1,800 feet. Red Bluff sheet.

Duncan Creek, West Fork (R); rises in Shasta County, in the northern part of T. 30 N., R. 9 W., on the east slope of Bully Choop Mountains, at altitude 4,000 feet above sea level; flows eastward, and unites with Middle Fork to form Duncan Creek; length, about 5 miles; fall, 2,000 feet. Red Bluff sheet.

Dunnigan Creek (R); rises in Yolo County in the western part of T. 12 N., R. 1 W., flows eastward into Colusa Basin near Dunnigan; intermittent. Sheet F, Sacramento Valley map.

Dutch Creek (L); rises in Eldorado County, in the northeastern part of T. 11 N., R. 10 E., at altitude 2,300 feet above sea level; flows south of west 3 miles into Irish Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 1,100 feet. Placerville sheet.

Dutch Gulch Creek (R); rises in Shasta County, in the northwestern part of T. 33 N., R. 7 W., at altitude 4,000 feet above sea level; flows southeastward into Clear Creek (tributary to Sacramento River); length, 3½ miles; fall, 2,600 feet. Red Bluff sheet.

Dutch Ravine Creek (L); rises in Placer County in the western part of T. 12 N., R. 8 E., at altitude 1,300 feet above sea level; flows westward 4 miles, then northwestward 2 miles into Auburn Ravine (tributary through Bunkham Slough to American Basin) near Gold Hill; fall, 1,100 feet; intermittent. Sacramento sheet.

Eagle Creek (L); rises in Shasta County, in T. 31 N., R. 7 W., at altitude 2,800 feet above sea level; flows southward 4 miles into North Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River) near Ono; fall, 2,200 feet. Red Bluff sheet.

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Eagle Gulch Creek (L); rises in Butte County, in the western part of T. 20 N., R. 8 E., at altitude 3,500 feet above sea level; flows northwestward 2 miles into Lost Creek (tributary to South Fork of Feather River, which flows through Middle Fork of Feather River to Feather River and thus to the Sacramento); fall, 450 feet. Bidwell Bar sheet.

East Branch or Fork. See name of main stream.

Echo Lake; Eldorado County, southeastern part of T. 12 N., R. 17 E., and northeastern part of T. 11 N., R. 17 E.; inlet, a stream draining 3 small lakes; this lake is without natural outlet but the water is led by aqueduct tunnel into the South Fork of American River (tributary through American River to the Sacramento) just north of Audrain Lake. Pyramid Peak sheet.

Echo Lake; Plumas County; southeastern part of T. 30 N., R. 7 E.; outlet, Rock Creek to Hamilton Branch of Feather River (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); elevation above sea level, about 6,000 feet. Punnett's map of Plumas County.

Elder Creek (R); formed in Tehama County by the junction of its North and South forks. The North Fork, which may be considered the continuation of the main stream, rises in the northwestern part of T. 25 N., R. 8 W., 4 miles east of Mount Linn at altitude 6,600 feet above sea level. The creek flows eastward and enters Sacramento River 1½ miles north of Tehama; length, about 40 miles; fall, 6,400 feet, of which 4,600 feet occurs in 8 miles at the head of the North Fork, and more than 1,000 feet more in the next 10 miles; intermittent in lower course; principal tributaries, South Fork and Willow Creek (Spring Branch). Red Bluff and Tehama sheets.

Elder Creek, South Fork (R); rises in Tehama County, in the northern part of T. 24 N., R. 8 W.; flows northeastward 3 miles, eastward 2 miles, southeastward 3 miles, then northeastward 6 miles; unites with North Fork to form Elder Creek (tributary to Sacramento River) near Lowry. Punnett's map of Tehama County.

Eldorado Creek (R); rises in Placer County, in the eastern part of T. 15 N., R. 11 E., near Forks House, at altitude 4,800 feet above sea level; flows southward about 8 miles through Forks House Ravine into North Fork of Middle Fork of American River (tributary through Middle Fork of American to North Fork of American and thus through American River to the Sacramento); fall, 3,100 feet; tributary Indian Creek. Colfax sheet.

Elk Creek (L); rises in Colusa County, in the eastern part of T. 13 N., R. 3 W.; flows northeastward to Salt Creek (which discharges into Colusa Basin) near Arbuckle. Sheet E, Sacramento Valley map.

Elk Creek (L); rises in Glenn County, in the northeastern part of T. 20 N., R. 8 W.; flows eastward about 10 miles, and unites with Stony Creek (tributary to Sacramento River) about 5 miles west of Fruto. Punnett's map of Glenn and Colusa counties.

Elkhorn Slough; Yolo Basin; extends southwestward from Sacramento along the west side of Merritt Island, east of Big Lake and Duck Slough. Sheet M, Sacramento Valley map.

Emigrant Creek (L); rises in Plumas County, in the eastern part of T. 24 N., R. 11 E., at altitude 7,000 feet above sea level; flows northeastward 3 miles into Little Grizzly Creek (tributary to Indian Creek which flows into North Fork of Feather River and thence through the Feather River to the Sacramento); total fall, about 1,400 feet. Downieville sheet.

Empire Creek (L); rises in Butte County, in T. 23 N., R. 4 E., at altitude 3,300 feet above sea level; flows northwestward 2 miles into West Branch of Feather River (tributary to North Fork of Feather River and thence through Feather River to the Sacramento); fall, 1,300 feet. Chico sheet.

Empire Creek (L); rises in Eldorado County, in the northern part of T. 12 N., R. 10 E., near Georgetown, at altitude 2,500 feet above sea level; flows southward 4

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miles, and unites with Manhattan Creek to form Irish Creek (tributary to South Fork of American River, and thus through American River to the Sacramento); fall, 600 feet. Placerville sheet.

Encinosa Creek (R); rises in Solano County, in the eastern part of T. 6 N., R. 72 W., at altitude 1,500 feet above sea level; flows eastward 3 miles into Alamo Creek (tributary to Cache Slough, Yolo Basin). Napa sheet.

Estray Creek (R); rises in Plumas County, in the eastern part of T. 24 N., R. 11 E., on the southern slope of Grizzly Mountain, at altitude 7,000 feet above sea level; flows southwestward 5 miles into Spring Garden Creek (tributary to Spanish Creek which flows through Indian Creek to the North Fork of Feather River and thus through Feather River into the Sacramento); total fall, 3,000 feet of which 2,000 feet occurs in the first 2 miles at head. Downieville sheet.

Eticuera Creek (L); rises in Napa County, in the northwestern part of T. 11 N., R. 4 W.; takes a general southerly course to its junction with Putah Creek (tributary to Yolo Basin) in the western part of Rancho Las Putas, about 5 miles northwest of Monticello; length about 16 miles. Punnett's map of Napa County.

Eureka Creek (L); rises in Plumas County in Eureka Lake in the eastern part of T. 22 N., R. 11 E., at altitude 6,200 feet above sea level; flows somewhat east of north 3 miles into Jamison Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); fall from Eureka Lake to Jamison Creek, about 1,700 feet. Downieville sheet.

Eureka Lake; Plumas County, eastern part of T. 22 N., R. 11 E.; 1 small inlet; outlet Eureka Creek to Jamison Creek (tributary through Middle Fork of Feather River to Feather River and thence to the Sacramento); elevation, 6,200 feet; fall of outlet, 1,800 feet. Downieville sheet.

Eureka Creek (R); rises in Sierra County, in the northwestern part of T. 20 N., R. 10 E., near Eureka, at altitude 5,000 feet above sea level; flows southward 2 miles, then eastward 1 mile into Goodyears Creek (tributary through North Fork of Yuba to Middle Fork of Yuba, and thus through Yuba and Feather rivers to the Sacramento); fall, 1,300 feet. Downieville sheet.

Fall Creek (L); rises in Butte County, in the northeastern part of T. 23 N., R. 4 E., at altitude 4,100 feet above sea level; flows irregularly westward into West Branch of Feather River (tributary through North Fork of Feather River to Feather River and the Sacramento); about 3 miles long; fall, 1,800 feet. Bidwell Bar and Chico sheets.

Fall Creek (R); rises in Nevada County, in the southern part of T. 18 N., R. 12 E., in Feeley Lakes, on the south slope of Fall Creek Mountain, at altitude 6,800 feet above sea level; flows southwestward 4½ miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 3,700 feet, of which 1,900 feet occurs in 1½ miles just above mouth. Colfax sheet.

Fall Creek (L); rises in Shasta County, in the southeastern part of T. 35 N., R. 4 W., at altitude 1,800 feet above sea level; flows northwestward 1½ miles into Salt Creek, which in turn flows into the Sacramento; fall, 700 feet. Redding sheet.

Fall River (L); Plumas County; rises in the southeastern part of T. 22 N., R. 8 E., at altitude 5,650 feet above sea level; flows southeastward about 10 miles, entering Butte County in the southeastern part of T. 21 N., R. 7 E., and then taking a circuitous but in general westerly course to its junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento) in the eastern part of T. 21 N., R. 6 E.; length, about 20 miles; fall, 4,650 feet. About 1 mile above its mouth Fall River leaps over a cliff perhaps 450 feet in height, forming a beautiful fall, below which is a series of cascades. Bidwell Bar folio (No. 43), Geol. Atlas U. S., U. S. Geol. Survey, 1898, p. 3.

Fall River (R); Shasta County; rises in the northeastern part of T. 37 N., R. 4 E., at altitude (approximate) 3,500 feet above sea level; flows very irregularly southeast-

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ward about 12 miles to its junction with Pit River (tributary to Sacramento River) at Fall River Mills; fall about 200 feet; principal surface tributary, Bear Creek; the large springs at the head of the river discharge about 1,500 second feet. Modoc Lava Bed sheet.

Fandango Creek (L); rises in the northeastern part of Modoc County, on the western slope of Warner Mountains, at altitude 6,000 feet above sea level; flows northwestward about 13 miles into Goose Lake, which at exceptionally high stages may be tributary to the North Fork of Pit River and thus through Pit River to the Sacramento; fall, 1,200 feet. Alturas sheet.

Faucherie Lake; Nevada County, T. 18 N., on line between Rs. 12 and 13 E.; inlet Canyon Creek from French Lake and several unnamed streams; outlet Canyon Creek which flows through Bowman Lake to its junction with South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation above sea level, 6,050 feet; below French Lake, 500 feet, above Bowman Lake, 550 feet, this stretch of Canyon Creek being 3 miles long; damned at outlet. Colfax sheet.

Feather River (R); heads on crest of Sierra Nevada, takes a general southwesterly course to junction with the Sacramento about 30 miles south of Marysville and 15 miles northwest of Sacramento. The river is formed by 3 principal branches, the North Fork draining about 2,220 square miles of the area at the north and west, the Middle Fork draining 1,340 square miles in the center and at the east, and Yuba River, draining about 1,300 square miles at the south.

The North Fork, which may be regarded as the continuation of the main stream, rises on the southern slope of Lassen Peak (elevation 10,437 feet), in the southeastern part of Shasta County, and flows southeastward about 32 miles to the lower end of Big Meadows where it turns and flows southwestward to its junction with Middle Fork, 4 miles west of Bidwell Bar. The stream is about 80 miles long. The total length of its basin does not exceed 75 miles and its width in Plumas County is about 65 miles. At the point where North Fork unites with Middle Fork the elevation is about 200 feet above sea level. For the greater part of its course the North Fork flows through a deep canyon and the tributaries are for the most part short streams drainjng precipitous slopes. Below the junction of the principal forks the Feather is about 100 miles long and the fall in this distance is about 180 feet.

The greater part of the Feather River basin is rough and mountainous and the slopes are deeply cut by innumerable stream channels. In the southern and eastern parts of the basin the rocks are chiefly granites; at the lower elevation some porous and deeply eroded tuffs and lavas are also found. The northern part of the basin is characterized by cones, craters, deposits of volcanic ash and lakes, which indicate recent volcanic activity.

The soil of the basin is porous, absorbs moisture readily, and serves to equalize the stream flow. The numerous meadows and valleys that exist in different parts of the area also help to maintain a steady flow of the streams during the dry season.

The basin is well forested. On the lower elevations the growth consists for the most part of brush and scrub timber. The mountain sides, especially around the summits of the highest peaks like Lassen are covered with merchantable timber. About two-thirds of the entire basin, 43,000 square miles in round numbers, is included in national forest reserves.

The mean annual precipitation in the Feather River basin is about 30 inches in foothill belt; toward the mountain summits it increases, ranging from 40 to 60 inches in the North and Middle fork basins and from 40 to 75 inches in the Yuba basin. In the winter much of it occurs as snow which remains on the summits until summer.

The basin affords many excellent storage sites, especially on the North and Middle forks. Surveys of a large number of reservoir sites in this area have been made by the United States Reclamation Service and many other sites have been surveyed by private companies.

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The minimum flow of the streams in the Feather River basin is sufficient to develop more than half a million horsepower and this amount could be almost doubled with storage. On North Fork alone about 300 horsepower could be developed at low water, and with storage half a million would be available. On Middle Fork only about 66,000 horsepower could be developed at low water, and on Yuba River only about 130,000.

The basin contains many large springs, especially in the lava districts, which supply a more or less steady flow throughout the year. In the North Fork basin especially are perennial springs that discharge 50 to 100 second-feet. One of the largest, Dotts Spring, about 3 miles east of Prattville, has a maximum discharge of 100 second-feet and a minimum discharge of 70 second-feet.

Gaging stations: North Fork above Prattville and near Big Bend 1905–1909; main stream at Oroville 1902–1909.

Lassen Peak, Honey Lake, Bidwell Bar, Sierraville, Smartville, Colfax, and Sacramento sheets; maps of Plumas, Butte, Sierra, Nevada, and Yuba counties.

Feather River, Little North Fork (R); rises in Plumas County, in the eastern part of T. 23 N., R. 6 E., on the west slope of Grizzly Hill, at altitude 6,200 feet above sea level; flows south of west 2 miles, then very irregularly southward 10 miles to junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento) in Butte County, in the northeastern part of T. 21 N., R. 6 E.; fall, 4,500 feet; tributaries, Axford, Coquette, and Mountain House creeks. Bidwell Bar sheet.

Feather River, Middle Fork (L); rises on the eastern slope of the Sierra Nevada in the southeastern part of Plumas County and flows irregularly westward to its junction with the North Fork (tributary to the Sacramento).

The basin is long but comparatively narrow, except at its east end, where it broadens out and includes Sierra Valley, a large mountain meadow at an altitude 5,000 feet above sea level. Beckwith Pass, which opens into this valley from the east, is the lowest pass in the Sierra Nevada, its elevation being about 5,200 feet above sea level. Sierra Valley and the surrounding country are very dry in summer. A number of streams, of which the most important are Smithneck and Hamlin creeks, enter Sierra Valley from the south and west. The waters of the streams entering from the east have no surface connection with the Middle Fork of Feather River. Those from the west, including Hamlin Creek, discharge into a marsh which has outlet northward to the Middle Feather near Beckwith.

The greatest elevation in the Middle Fork basin is about 8,500 feet above sea level. The river is about 95 miles long and its drainage area comprises 1,340 square miles. Between Beckwith at the lower end of Sierra Valley and the junction of the Middle and North Forks the total fall is 4,700 feet.

The mean annual precipitation in the basin of the Middle Fork ranges from 40 to 60 inches; horsepower available at low water stage about 66,000.

Gaging station at Cromberg 1910–1911.

Sierraville, Downieville, and Bidwell Bar sheets.

Feather River, Middle Fork, South Branch (L); rises in Plumas County, in the eastern part of T. 22 N., R. 8 E., at altitude 5,700 feet above sea level; flows southwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 15 miles; fall, 4,000 feet, of which 1,500 feet occurs in 2 miles at mouth; drainage basin long, narrow, and very mountainous; tributaries all short, Pinkard and Cascade creeks, the most important, being less than 5 miles long. Bidwell Bar sheet.

Feather River, North Fork. See *Feather River.*

Feather River, North Fork, Little. See *Feather River, Little North Fork.*

Feather River, South Fork (L); rises in Plumas County, in the northwestern part of T. 22 N., R. 10 E., on the west slope of Pilot Peak, at altitude 6,500 feet above sea level; flows southwestward to its junction with Middle Fork Feather River (trib-

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utary through Feather River to the Sacramento); length, about 40 miles; fall, 6,100 feet; drainage area very narrow; most of the tributaries less than a mile long. Downieville and Bidwell Bar sheets.

Feather River, West Branch (R); rises in Butte County, in the north-central part of T. 25 N., R. 5 E., at altitude 6,000 feet above sea level; flows northwestward 3 miles, then very irregularly southward to its junction with North Fork of Feather River (tributary through Feather River to the Sacramento) in the eastern part of T. 21 N., R. 4 E.; length, about 37 miles; fall, 5,500 feet; drainage basin comparatively narrow; most of the tributaries are short streams draining steep slopes. Lassen Peak and Chico sheets.

[Feather River] West Branch Creek, Little (R); rises in Butte County, in the southwestern part of T. 24 N., R. 4 E., at altitude 4,000 feet above sea level; flows southward into West Branch of Feather River (tributary to North Fork of Feather River and thus through Feather River to the Sacramento); length, 7 miles; fall, 2,200 feet; tributary Long Gulch Creek. Chico sheet.

Feeley Lakes; Nevada County, southern part of T. 18 N., R. 12 E.; 3 connected lakes; outlet, Fall Creek to South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation of lower lake, 6,700 feet; of middle lake, 6,800 feet; of the upper lake, about 6,900 feet. Colfax sheet.

Fiddle Creek (R); rises in Sierra County, in the southeastern part of T. 20 N., R. 9 E., at altitude 5,500 feet above sea level; takes a general southwesterly course to its junction with North Fork of Yuba River (tributary to Middle Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); length, 8 miles; fall, 3,200 feet. Downieville sheet.

Fiddler Creek (L); rises in Shasta County, in the northeastern part of T. 29 N., R. 8 W., about 1,400 feet above sea level; flows southeastward 3 miles into Middle Fork of Cottonwood Creek (tributary through Cottonwood Creek to the Sacramento); fall, about 700 feet. Red Bluff sheet.

Fish Creek (L); rises in Butte County, in the southwestern part of T. 25 N., R. 5 E., about 2 miles west of Table Mountain, at altitude 5,000 feet above sea level; flows southwestward 4 miles into West Branch of Feather River (tributary through North Fork of Feather River and Feather River to the Sacramento); fall, 1,900 feet. Bidwell Bar and Chico sheets.

Fishermens Lake; American Basin, Sacramento County; a northwestward extending arm of Bush Lake. This lake lies about 1 mile east of Sacramento. Davisville sheet.

Fiske Creek (R); rises in Yolo County, in the southern part of T. 12 N., R. 4 W.; flows northward 5 miles into Cache Creek (tributary to Yolo Basin); channel dry soon after the last rains of the season and remains dry until the next wet season. Punnett's map of Yolo County.

Fitzhugh Creek (R); rises in southeastern part of Modoc County, on western slope of Warner Mountains, 4 miles west of Warren Peak, at altitude 6,000 feet above sea level; flows westward about 12 miles into South Fork of Pit River (tributary through Pit River to the Sacramento); fall, approximate, 1,500 feet. Alturas sheet.

Five Lakes; Placer County, northwestern part of T. 15 N., R. 16 E.; outlet Five Lakes Creek to Rubicon River (tributary through Middle Fork of American River to North Fork American and thus through American River to the Sacramento); elevation, 7,500 feet; fall of outlet, 2,500 feet in 9 miles. The lakes are very small and are connected. Truckee sheet.

Five Lakes Creek (R); rises in Placer County in the northwestern part of T. 15 N., R. 16 E., in Five Lakes at altitude 7,500 feet above sea level; flows southwestward 9 miles into Rubicon River tributary to North Fork of American River and thus through American River to the Sacramento); fall, 2,500 feet. Truckee sheet.

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Flat Creek (L); Shasta County, rises in the southwest part of T. 31 N., R. 5 W., at altitude 1,100 feet above sea level; flows east and then south, but water sinks before reaching Clear Creek (tributary to Sacramento River) to which the basin is topographically tributary; length, about 3 miles; fall, 300 feet; intermittent. Redding sheet.

Flat Creek (R); Shasta County; rises in the western part of T. 33 N., R. 6 W., at altitude 2,000 feet above sea level; flows southeastward into Sacramento River; fall, 1,400 feet; intermittent. Redding sheet.

Flat Creek (R); Shasta County; rises in the southern part of T. 35 N., R. 2 W., on the south slope of Brock Butte, at altitude 2,500 feet above sea level; flows southward 4½ miles into Pit River (tributary to Sacramento River); fall, 1,500 feet; intermittent in upper part of course. Redding sheet.

Flea Valley Creek (R); rises in Butte County, in the southeastern part of T. 24 N., R. 4 E., at altitude 4,000 feet above sea level; flows southeastward 3 miles to junction with North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,300 feet. Bidwell Bar sheet.

Ford Ravine Creek (R); rises in Placer County in the northwestern part of T. 15 N., R. 11 E., at altitude 4,000 feet above sea level; flows southeastward 1½ miles into North Fork of American River (tributary through American River to the Sacramento); fall, 2,500 feet. Colfax sheet.

Fordyce Creek (R); rises in Nevada County, in the southern part of T. 18 N., R. 13 E., in Fordyce Lake, at altitude 6,300 feet above sea level; flows southwestward into South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); length, 8 miles; fall, 1,600 feet; tributaries from a number of small lakes. Truckee and Colfax sheets.

Fordyce Lake; Nevada County, on boundary between Ts. 17 and 18 N., R. 13 E.; inlets North Creek and a number of small unnamed streams; outlet Fordyce Creek to South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); elevation, 6,300 feet; fall of outlet, 1,600 feet. Truckee sheet.

Frazier Creek (R); rises in Butte County, in the northwestern part of T. 21 N., R. 5 E., on the south slope of Big Bend Mountain, at altitude 2,500 feet above sea level; flows southeastward about 2 miles into North Fork of Feather River (tributary through Feather River to the Sacramento) opposite the mouth of Berry Creek; fall, 1,900 feet. Bidwell Bar sheet.

Frazier Creek (L); rises in Plumas County, in Gold Lake, in the northwestern part of T. 21 N., R. 12 E., at altitude 6,300 feet above sea level; flows northeastward 6 miles into Middle Fork of Feather River (tributary through Feather River to the Sacramento) in Mohawk Valley; fall, about 1,900 feet. Downieville sheet.

Freeman Creek (R); rises in Plumas County in the northwestern part of T. 23 N., R. 13 E., at altitude 6,800 feet above sea level; takes a general northerly course into Grizzly Creek (tributary through Middle Fork of Feather River and Feather River to the Sacramento); about 5 miles long; fall, 1,000 feet. Downieville sheet.

French Creek (L); Butte County; rises in the southwestern part of T. 26 N., R. 6 E., at altitude 5,000 feet above sea level; flows very irregularly southwestward to junction with North Fork of Feather River (tributary through Feather River to the Sacramento) opposite the east base of Big Bend Mountain in the northern part of T. 21 N., R. 5 E.; length, about 10 miles; fall, 4,200 feet; many small tributaries, including Brush, Peavine, Rum, Bidwell, and Mosquito creeks. Bidwell Bar sheet.

French Creek (L); Glenn County; rises in the northern part of T. 20 N., R. 4 W.; flows southeastward through Stone Valley into the South Fork of Willows Creek (to Colusa Basin); intermittent. Sheet B, Sacramento Valley map.

French Creek (L); Shasta County; rises in the northwestern part of T. 32 N., R. 2 W., at altitude 1,000 feet above sea level; flows southwestward across Swede Creek plains into Little Cow Creek (tributary through Cow Creek to Sacramento River); length, about 7 miles; fall, 600 feet; intermittent. Redding sheet.

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French Lake; Nevada County, western part of T. 18 N., R. 13 E., 1 mile west of Summit City; several small inflowing streams; outlet, Canyon Creek, which flows from Faucherie and Bowman lakes to its junction with South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation 6,550 feet above sea level; elevation above Faucherie Lake, 450 feet, the connecting stream being about a mile long; dammed at outlet. The lake is about 1½ miles long and at its upper end are several small islands. Colfax sheet.

Frenchman Creek (R); rises in Butte County, in the southwestern part of T. 24 N., R. 15 E., at altitude 7,500 feet above sea level; flows eastward 7 miles to its junction with Last Chance Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); fall, 2,000 feet. Sierraville sheet.

Fresh Pond Ravine Creek (L); rises in Eldorado County, in the southern part of T. 11 N., R. 13 E., at altitude 4,000 feet above sea level; flows northwestward into South Fork of American River (tributary through American River to the Sacramento); length, 1 mile; fall, 1,400 feet. Placerville sheet.

Fresh Water Creek (R); rises in Colusa County, in the central part of T. 15 N., R. 5 W.; flows southeastward 4 miles, eastward 1 mile, northward 3 miles, then very irregularly northeastward into Powell Slough, Colusa Basin; intermittent. Sheet D, Sacramento Valley map.

Frey Creek (L); rises in Butte County, in the southwestern part of T. 21 N., R. 7 E., at altitude 4,200 feet above sea level; flows southwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento) one-half mile below mouth of Fall River; length, 5 miles; fall, 3,200 feet. Bidwell Bar sheet.

Fuller Lake; Nevada County, northwestern part of T. 17 N., R. 12 E.; outlet, Jordan Creek to South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation, 5,250 feet above sea level; fall of outlet, 750 feet. Colfax sheet.

Funk Creek (R); rises in Glenn County, in the southern part of T. 18 N., R. 5 W.; flows southeastward; discharges into Colusa Basin; intermittent. Sheet C, Sacramento Valley map.

Gaddis Creek (R); rises in Eldorado County, in the western part of T. 12 N., R. 12 E., at altitude 4,500 feet above sea level; flows southeastward about 3 miles into Slab Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 400 feet. Placerville sheet.

Gansers Slough Creek (R); rises in Plumas County, in the southeastern part of T. 24 N., R. 9 E. at altitude 5,500 feet above sea level; flows northward 2½ miles to Spanish Creek (tributary to Indian Creek and thence through North Fork of Feather River to Feather River and into the Sacramento); total fall 1,600 feet. Downieville sheet.

Gas Canyon Creek (R); rises in Placer County, in the northeastern part of T. 13 N., R. 9 E., at altitude 2,600 feet above sea level; flows westward 2 miles, then west of south 3 miles into Middle Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,750 feet. Placerville sheet.

Gent Creek (R); rises in Nevada County, in the central part of T. 16 N., R. 7 E., at altitude 1,900 feet above sea level; flows southwestward into Squirrel Creek (tributary through Feather River to the Sacramento); length 1 mile; fall, 400 feet. Smartsville sheet.

Georgiana Slough; Sacramento Basin, between Walnut Grove on old Sacramento River and Mokelumne. Sacramento Valley map.

Gerlé Creek (L); rises in Eldorado County, in the northeastern part of T. 13 N., R. 15 E., in Loon Lake at altitude 6,300 feet above sea level; flows westward 4 miles, then irregularly southward 5 miles into Little South Fork of Rubicon River (tributary to Middle Fork of American River and thus through American River to the Sacra-

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mento); length, about 9 miles; fall, about 1,350 feet. Truckee and Pyramid Peak sheets.

Gibson Ravine Creek (L); rises in Butte County, in the southwestern part of T. 20 N., R. 7 E., at altitude 3,000 feet above sea level; flows northwestward 2 miles into South Fork of Feather River (tributary to Middle Fork of Feather and thus through Feather River to Sacramento River); fall, 1,100 feet. Bidwell Bar sheet.

Gilsizer Slough; Sutter Basin, extends southwestward into the basin from Feather River at Marysville. Gilsizer Slough sheet. See also Sacramento Valley map.

Glen Valley Slough; Colusa County, extending eastward about 10 miles from the southwestern part of T. 16 N., R. 14 W., into Colusa Basin, 4 miles west of Colusa. Sheet D, Sacramento Valley map.

Gold Canyon Creek (L); rises in Sierra County, in the southern part of T. 22 N., R. 10 E., at altitude 6,700 feet above sea level; flows northwestward 3 miles into East Branch of Slate Creek (tributary to North Fork of Yuba River which flows to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 1,300 feet. Downieville sheet.

Gold Lake; Plumas County, western part of T. 24 N., R. 8 E., northwest of Spanish Creek; three small inlets; outlet, a stream 1 mile long, flowing northeastward to Silver Creek (tributary to Indian Creek and thence through North Fork of Feather River to Feather River and into the Sacramento); elevation, about 6,150 feet. Bidwell Bar sheet.

Gold Lake; Sierra County, northwestern part of T. 21 N., R. 12 E.; inlets from several small lakes; outlet, Frazier Creek to Middle Fork of Feather River (tributary through Feather River to the Sacramento); elevation, 6,300 feet. This lake is about 1 mile long and one-half mile in maximum width Downieville sheet.

Goodyears Creek (R); rises in Sierra County, in the southern part of T. 21 N., R. 10 E., on the south slope of Saddleback Mountain, at altitude 6,000 feet above sea level; flows southward into North Fork of Yuba River (tributary through Middle Fork of Yuba to Yuba River, and thus through Feather River to the Sacramento); length, 7 miles; fall, 3,400 feet; tributary, Eureka Creek; gaging station at Goodyears Bar, 1910–11. Downieville sheet.

Goose Lake; Butte County, three-fourths mile west of Soto Lake; an intermittent water body, probably fed by high stages of Pine Creek and disappearing by evaporation; elevation, about 180 feet. Vina sheet.

Goose Lake; northern part of Modoc County, Cal., and southern part of Lake County, Oreg., about two-thirds of the lake being in California but by far the greater portion of the valley being in Oregon; elevation, about 4,800 feet above sea level; length, 28 miles; maximum width, 10 miles; inlets, 16 streams in California with an aggregate drainage area of about 250 square miles, and 6 streams in Oregon; aggregate discharge of all the streams estimated at 60,000 acre-feet annually; maximum depth, not more than 20 feet; water alkaline; annual rainfall on open surface of lake estimated at 14 inches; probably receives a large supply of water from subsurface springs.

It is said that in the early sixties an emigrant trail crossed the valley of the creek at a place where the water is now several feet deep, but a few years later the lake rose so as to extend several miles farther north than it now extends and for a short time in 1869 it overflowed southward to the North Fork of Pit River. In 1881 it is reported to have overflowed to Pit River for more than 2 hours during a severe storm from the north.

Surveys and data: Alturas sheet; Russell, I. C., A geological reconnaissance in southern Oregon: Fourth Ann. Rept. U. S. Geol. Survey, 1884, pp. 456–457; Waring, G. A., Geology and water resources of a portion of south-central Oregon; Water-Supply Paper U. S. Geol. Survey No. 220, 1908, pp. 10, 12, 39, 42–43, 50–51.

Granite Canyon Creek (L); rises in Eldorado County, the southern part of T. 11 N., R. 10 E., at altitude 1,300 feet above sea level; flows west 1 mile, then north 1½ miles into South Fork of American River (tributary through American River to Sacramento River) at Lotus; fall, 600 feet. Placerville sheet.

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Granite Creek (R); rises in Placer County, in the northeastern part of T. 16 N., R. 14 E., in small lakes on the west slope of Devils Peak (altitude 7,700 feet); flows southeastward into North Fork of American River (tributary to Sacramento River); fall, about 2,500 feet. Truckee and Colfax sheets.

Granite Creek, Little (R); rises in Placer County, in the northern part of T. 16 N., R. 13 E., at altitude 6,700 feet above sea level; flows southeastward 3 miles, then southward one-half mile into Granite Creek (tributary through North Fork of American to American River and thus to the Sacramento); fall, 2,500 feet. Colfax sheet.

Gray Eagle Creek (L); rises in Plumas County, in Long Lake, in the northwestern part of T. 21 N., R. 12 E., at altitude 6,700 feet above sea level; flows northeast through Gray Eagle Valley to its junction with the Little Fork of Feather River in Mohawk Valley; length, about 6 miles; fall, 2,200 feet. Downieville sheet.

Grass Lake; Plumas County, southeastern part of T. 22 N., R. 11 E.; inlet Little Jamison Creek, which flows through the lake to its junction with Jamison Creek (tributary to Middle Fork of Feather River and thence through Feather River to the Sacramento); elevation, 5,850 feet above sea level; fall of Little Jamison Creek between Grass Lake and Jamison Creek, 550 feet. Downieville sheet.

Greenhorn Creek, Little (R); rises in Nevada County in the southeastern part of T. 16 N., R. 9 E., at altitude 3,000 feet above sea level; flows southeastward into Greenhorn River (tributary to Bear River and thus through Feather River to the Sacramento); length, 5 miles; fall, 600 feet. Colfax sheet.

Greenhorn River (R); rises in Nevada County, in the northern part of T. 16 N., R. 10 E., 2 miles west of Remington, at altitude 4,500 feet above sea level; flows southwestward into Bear River (tributary through Feather River to the Sacramento); length about 13 miles; fall, 2,500 feet. Colfax sheet.

Greens Creek (L); rises in Shasta County, in the northwestern part of T. 34 N., R. 3 W., on western slope of Town Mountain, at altitude 2,500 feet above sea level; flows irregularly westward into McCloud River (tributary through Pit River to the Sacramento); length, 2½ miles; fall, 1,650 feet. Redding sheet.

Greens Lake; Yolo Basin, 5 miles south of west of Sacramento and 2 miles west of Washington Lake; a water body about 1 mile long, mapped as permanent on the Sacramento Valley map, sheet L.

Green Spring Creek (R); rises in Eldorado County, in the southwestern part of T. 10 N., R.9 E., at altitude 1,200 feet above sea level; flows northwestward 2½ miles, then south of west 1½ miles into New York Creek (tributary through South Fork of American River to American River and the Sacramento); fall, 600 feet. Sacramento sheet.

Greenwood Creek (R); rises in Eldorado County in the northwestern part of T. 12 N., R. 10 E., 2½ miles northeast of Greenwood, at altitude 2,500 feet above sea level; takes a very irregular but in general southwesterly course to its junction with South Fork of American River (tributary through American River to the Sacramento); one-half mile south of Magnolia; length, 10 miles; fall, 1,800 feet; several tributaries, one of which, Lichen Creek, is named on the map. Placerville sheet.

Grindstone Creek (L); rises in Glenn County, on the eastern slope of the Coast Range, near the center of T. 23 N., R. 10 W.; takes a general southeasterly course to junction with Stony Creek (tributary to Sacramento River) in T. 21 N., R. 6 W.; drainage area, mountainous; length, about 30 miles; many branching tributaries. Punnett's map of Glenn and Colusa counties.

Grindstone Creek, South Fork (R); rises in Glenn County, in the western part of T. 21 N., R. 8 W., on the eastern slope of the Coast Range; flows eastward 3 miles, then northeastward 4 miles, to junction with Grindstone Creek (tributary through Stony Creek to Sacramento River). Punnett's map of Glenn and Colusa counties.

Grizzly Canyon Creek (R); rises in Eldorado County, in the northwestern part of T. 13 N., R. 11 E., at altitude 3,100 feet above sea level, near Volcanoville; flows south-

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eastward 1 mile into Missouri Canyon Creek (tributary through Otter Creek to Middle Fork of American River and thus through North Fork of American and American rivers to the Sacramento); fall, 500 feet. Placerville sheet.

Grizzly Canyon Creek (R); rises in Placer County, in the southeastern part of T. 15 N., R. 10 E., at altitude 3,200 feet above sea level; flows southeastward 2½ miles into Shirttail Canyon Creek (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,300 feet. Colfax sheet.

Grizzly Canyon Creek, Little (L); rises in Placer County, in the southwestern part of T. 13 N., R. 13 E., at altitude 5,300 feet above sea level; flows eastward 1½ miles into Grizzly Creek (tributary through Rubicon River to Middle Fork of American and thus through North Fork of American to American River and the Sacramento); fall, 1,300 feet. Placerville sheet.

Grizzly Creek (L); Nevada County; rises 2 miles northwest of Columbia Hill, at altitude 3,600 feet above sea level; flows southwestward into Middle Fork of Yuba River (tributary to Yuba River and thus to Feather River and the Sacramento); length, 5 miles; fall, 1,800 feet. Colfax sheet.

Grizzly Creek (R); PlacerCounty; rises in the northeastern part of T. 13 N., R. 13 E., at altitude 5,200 feet above sea level; flows southwestward 7 miles into Rubicon River (tributary to iddle Fork of American and thus through North Fork of American and American rivers to the Sacramento); fall, 2,700 feet. Placerville sheet.

Grizzly Creek (L); Plumas County; rises near the center of T. 23 N., R. 7 E., on the southern slope of Grizzly Hill (altitude, 6,100 feet); flows north, northwest, and southwest, encircling the hill, and enters North Fork of Feather River (tributary through Feather River to the Sacramento) from the west in the northeastern part of T. 23 N., R. 5 E.; length, 10 miles; fall, 3,000 feet; flows throughout in a deep canyon. Bidwell Bar sheet.

Grizzly Creek (R); Plumas County; rises in the west-central part of T. 24 N., R. 12 E., at altitude 6,000 feet above sea level; flows eastward 6 miles, then southeastward 10 miles to its junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento) near Kerby; fall, about 1,200 feet. In its upper course this creek flows through a comparatively open meadow called Grizzly Valley. Sierraville and Downieville sheets.

Grizzly Creek (L); Sierra County; rises in the northwestern part of T. 18 N., R. 9 E., at altitude 3,500 feet above sea level; flows southwestward 2 miles, then northwestward 4 miles into Oregon Creek (tributary to Middle Fork of Yuba River and thus through Yuba River to Feather River and the Sacramento); fall, 1,300 feet. Colfax and Smartsville sheets.

Grizzly Creek, Little (L); Plumas County; rises in the northeastern part of T. 24 N., R. 12 E., 2 miles south of Mount Ingalls, at altitude 6,800 feet above sea level; flows somewhat south of west about 3 miles, then northwestward 11 miles to junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento) 1 mile west of Genesee; total fall, 3,300 feet; drains northeastern slope of Grizzly Mountains. Sierraville sheet and IndianValley special map.

Grizzly Gulch Creek (L); rises in Shasta County, in the western part of T. 33 N., R. 6 W., at altitude 2,800 feet above sea level; flows southward 4 miles into Clear Creek (tributary to Sacramento River); fall, 1,700 feet. Red Bluff sheet.

Grizzly Hollow Creek (L); rises in Butte County, in the southwestern part of T. 23 N., R. 2 E., at altitude about 700 feet above sea level; flows southwestward 4 miles into Sheep Hollow Creek (tributary through Sycamore Creek to Mud Creek, and thus through Big Chico Creek to the Sacramento); fall, about 450 feet. Chico sheet.

Grouse Creek (L); rises in Placer County, in the southeastern part of T. 15 N., R. 13 E., at altitude 5,400 feet above sea level; flows north of west 4½ miles, then southwestward 3½ miles into North Fork of Middle Fork of American River (tributary

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through Middle Fork of American to North Fork of American and thus through American River to the Sacramento); fall, 3,000 feet, of which 900 feet occurs in 1 mile just above the mouth. Colfax sheet.

Hamilton Branch (R); rises in southwestern part of Lassen County in the southern part of T. 28 N., R. 10 E. (altitude 6,000 feet above sea level); flows westward about 12 miles through mountain meadows, then turns and flows southward about 6 miles through the lower end of Big Meadows to its junction with North Fork of Feather River (tributary through Feather River to the Sacramento) 3 miles west of Prattville, Plumas County. This basin ranges in elevation from 4,300 to 7,500 feet; drainage area of Hamilton Branch, 230 square miles; fall, about 1,500 feet. Gaging station near Prattville 1905–1907. Honey Lake and Lassen Peak sheets.

Hamilton Slough; southern part of Butte County, in Butte Basin, between Feather River and Dry Creek, just south of Biggs; carries overflow water from Feather River into Butte Basin. Marysville sheet.

Hamlin Creek (L); rises in Sierra County, in the northwestern part of T. 19 N., R. 14 E., at altitude 6,500 feet above sea level; flows northward 8 miles, and discharges into the marsh at the west side of Sierra Valley on Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall above marsh, 1,600 feet, of which 1,000 feet occurs in the first mile at head of stream. Sierraville sheet.

Hampshire Creek (R); rises in Yuba County, in the northeastern part of T. 19 N., R. 7 E., near Clover Mills, at altitude 3,500 feet above sea level; flows south of east 2 miles into North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 1,500 feet. Bidwell Bar sheet.

Hangtown Creek (R); rises in Eldorado County, in the northern part of T. 10 N., R. 11 E., 2 miles east of Placerville, at altitude 2,300 feet above sea level; flows somewhat north of west about 6 miles into Webber Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 1,000 feet. Placerville sheet.

Haskell Creek (R); rises in Sierra County, in the southwestern part of T. 21 N., R. 13 E., on the west slope of Haskell Peak, at altitude 7,300 feet above sea level; flows southward 2 miles into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); fall, 1,600 feet. Downieville sheet.

Hass Slough; Yolo Basin; an outlet channel extending northeastward into Cache Slough. Sheet P, Sacramento Valley map.

Hastings Creek (R); rises in Eldorado County, in the central part of T. 12 N., R. 9 E., at altitude 1,700 feet above sea level; flows southward into South Fork of American River (tributary through American River to the Sacramento) 1 mile west of the mouth of Greenwood Creek; length, 6 miles; fall, 900 feet. Placerville sheet.

Hatchet Creek (L); rises in Shasta County, in the east-central part of T. 35 N., R. 1 E., at altitude 3,800 feet above sea level; flows westward about 8 miles to junction with Pit River (through which it is tributary to Sacramento River); fall, 2,500 feet. Lassen Peak sheet.

Hat Creek (L); rises in the southeastern part of Shasta County, in a small lake on the northeast slope of Lassen Peak, at altitude (approximate) 7,300 feet; takes a general northerly course to its junction with Pit River (tributary to Sacramento River) 1 mile northwest of Carbon; length, about 38 miles; fall, 4,600 feet, of which 2,700 feet occurs in the first 8 miles of its course; principal tributary, Lost Creek; fed largely by springs issuing from the northern slope of Lassen Peak; minimum flow, several hundred second-feet; estimated horsepower available, 100,000. Gaging station at Hat Creek, 1910–11. Lassen Peak sheet.

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Hawkins Canyon Creek (R); rises in Nevada County, in the northwestern part of T. 15 N., R. 10 E., near You Bet, at altitude 3,000 feet above sea level; flows southeastward 1 mile into Steep Hollow Creek (tributary through Bear River to Feather River and thus to the Sacramento); fall, 500 feet. Colfax sheet.

Hawley, Lake; Sierra County, eastern part of T. 21 N., R. 11 E.; outlet, East Fork of North Fork of Yuba River to North Fork of North Fork of Yuba River (tributary through North Fork of Yuba to Middle Fork of Yuba, and thus through Yuba River to Feather River and the Sacramento), Downieville branch; elevation, 6,700 feet. Downieville sheet.

Hayes Hollow Creek (L); rises in Glenn County, in the western part of T. 20 N., R. 4 W.; flows southeastward into the South Fork of Willows Creek (to Colusa Basin); intermittent. Sheet B, Sacramento Valley Creek.

Hazel Creek (L); rises in Shasta County, in the northwestern part of T. 37 N., R. 3 W., and the northeastern part of T. 37 N., R. 4 W.; flows irregularly westward to its junction with Sacramento River near Sims station; length, about 6 miles; approximate fall, 1,000 feet. Shasta sheet.

Hibbard Gulch Creek (L); rises in Tehama County, in the southwestern part of T. 26 N., R. 1 W., at altitude 700 feet above sea level; flows northwestward 2 miles into Little Wildcat Creek (tributary through Wildcat Creek to Rio de los Berrendos and thus through Antelope Creek to the Sacramento); intermittent; fall, 350 feet. Tehama sheet.

High Rock Ravine Creek (R); rises in Butte County 1 mile east of Oregon City, in T. 20 N., R. 4 E., at altitude 1,200 feet above sea level; flows southeastward 3 miles, then east of north 1 mile into North Fork of Feather River 1 mile above junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall, 900 feet. Chico and Bidwell Bar sheets.

Hinchman Ravine Creek (R); rises in Plumas County, in southwestern part of T. 26 N., R. 11 E., at altitude 6,000 feet above sea level; flows somewhat west of south 2½ miles into Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 2,400 feet. Indian Valley special map.

Hirz Creek (R); rises in Shasta County, in the southeastern part of T. 35 N., R. 4 W., at altitude 1,500 feet above sea level; flows eastward 1½ miles, then southeastward 1½ miles to junction with McCloud River (tributary through Pit River to the Sacramento); fall, 600 feet. Redding sheet.

Hoboken Creek (R); rises in Eldorado County, in the southwestern part of T. 13 N., R. 10 E., 1 mile southeast of Spanish Diggings, at altitude 2,300 feet above sea level; flows westward 2 miles into American Canyon Creek (tributary to Middle Fork of American River and thus through North Fork of American and American rivers to the Sacramento); fall, 1,300 feet. Colfax sheet.

Hog Canyon Creek (L); rises in Sierra County, in the eastern part of T. 20 N., R. 11 E., at altitude 6,700 feet above sea level; flows westerly to junction with East Fork of North Fork of Yuba River (tributary through North Fork of North Fork of Yuba, Downieville branch, to North Fork of Yuba, and thus through Middle Fork of Yuba and Yuba rivers to Feather River and the Sacramento); length, 4 miles; fall, 2,700 feet. Downieville sheet.

Hog Gulch Creek (L); rises in Tehama County, in the southeastern part of T. 27 N., R. 2 W., at altitude 1,200 feet above sea level; flows southwestward 4½ miles into Antelope Creek (tributary to Sacramento River) in Rio de los Berrendos Rancho; intermittent; fall, 950 feet, of which 920 feet occurs in upper 3 miles of course. Tehama sheet.

Hoghollow Creek (R); rises in Lake County, in the southern part of T. 14 N., R. 7 W.; flows eastward about 3 miles into North Fork of Cache Creek (tributary through Cache Creek to Yolo Basin). Punnett's map of Lake County.

Hog Lake; Sutter Basin, Sutter County, 3 miles east of the river; a permanent lake on the edge of the basin. Dunnigan sheet.

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Honcut Creek (R); Butte County; formed by the union of North and South branches. North Honcut Creek, which drains the larger area and may therefore be considered the continuation of the main stream, rises in the central part of T. 19 N., R. 5 E., near Hurlton, at altitude 1,500 feet above sea level; flows northwestward 3 miles, then turns abruptly and takes a general southwesterly course to its iunction with Feather River (tributary to Sacramento River) 10 miles north of Marysville; length, including major windings, about 25 miles; total fall, a little more than 1,400 feet, of which 500 feet occurs in the first 2 miles, 500 feet in the next 7 miles, and 400 feet in the succeeding 7 miles; fall in the remaining 9 miles almost inappreciable. Principal tributaries, Rocky Honcut and Wyandotte creeks, which flow into North Honcut; and Natchez Honcut, Date, and Prairie creeks, which join the South Honcut. The South Honcut forms part of the boundary between Butte and Yuba counties. Smartsville and Marysville sheets.

Honcut Creek, Natchez (R); rises in Butte County, in the western part of T. 19 N., R. 6 E., at altitude 2,500 feet above sea level; flows southward into South Honcut Creek (tributary through Honcut Creek to Feather River and thus to the Sacramento); fall, 1,300 feet. Smartsville sheet.

Honcut Creek, Rocky (L); rises in Butte County, in the southeastern part of T. 19 N., R. 5 E., 1 mile south of Hurleton, at altitude 1,900 feet above sea level; flows irregularly southwestward to its junction with North Honcut Creek (tributary through Honcut Creek to Feather River and thus to the Sacramento); length, about 6 miles; fall, 1,300 feet. Smartsville sheet.

Honcut Creek, South (L); rises in Yuba County, in the northern part of T. 19 N., R. 6 E., 1½ miles northwest of Brownsville, at altitude 2,500 feet above sea level; flows southwestward to its junction with North Honcut Creek (tributary through Honcut Creek to Feather River and thus to the Sacramento) in T. 17 N., R. 3 E.; length, 24 miles; fall, 2,400 feet, of which 1,000 feet occurs in the first 2 miles at the head and 1,000 feet more in the next 8 miles; forms boundary between Butte and Yuba counties; principal tributaries, Natchez Honcut, Date, and Prairie creeks. Smartsville and Marysville sheets.

Honey Run (L); rises in Butte County, near the center of T. 22 N., R. 3 E., 1 mile northwest of Paradise, at altitude 1,900 feet above sea level; flows southwest 1 mile then west 2½ miles into Little Butte Creek (tributary through Butte Creek to Butte Basin); fall, 1,300 feet. Chico sheet.

Hooker Creek (R); rises in Tehama County, in the southern part of T. 28 N., R. 5 W., at altitude 700 feet above sea level; flows northeastward 5 miles, then northward 6 miles to junction with Cottonwood Creek (tributary to Sacramento River); fall, about 300 feet. Red Bluff sheet.

Hooper Creek (L); rises in Tehama County, in T. 28 N., R. 1 W., at altitude 1,250 feet above sea level; flows westward 4½ miles into Salt Creek (tributary to Sacramento River); fall, 580 feet; intermittent. Tehama sheet.

Hopkins Creek (R); rises in Plumas County near the center of T. 22 N., R. 10 E., on the south slope of Bald Peak, at altitude 7,000 feet above sea level; flows northeastward into Poorman Creek (tributary through Nelson Creek to Middle Fork of Feather River and thus through Feather River to the Sacramento); length, 3 miles; fall, 2,000 feet. Downieville sheet.

Hopkins Slough; Colusa Basin; extends from a point 3 miles northwest of Colusa southward to Powell Slough. Sheet D, Sacramento Valley map.

Horse Creek (L); Lassen County. See *Coyote Creek*.

Horse Creek (R); Shasta County; rises in the western part of T. 34 N., R. 3 W., on the northeast slope of Horse Mountain, 2,000 feet above sea level; flows southeastward 3½ miles into Squaw Creek (tributary to Pit River and thus to the Sacramento) 1 mile above Copper City; fall, about 1,200 feet. Redding sheet.

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Horseshoe Lake; Sutter Basin, Sutter County, one-eighth mile east of Sacramento River and one-fourth mile south of Collins Eddy. Dunnigan sheet.

Horseshoe Lake; Sutter Basin, Sutter County; one-half mile east of Sacramento River, 3 miles southeast of Knights Landing. Knights Landing sheet.

Hosselkus Creek (R); rises in Plumas County, in northwestern part of T. 26 N., R. 11 E., on south slope of Kettle Rock (altitude 7,500 feet above sea level); flows somewhat west of south about 9 miles to a junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento) at lower end of Genesee Valley. Total fall, 3,400 feet. Indian Valley special map.

Houghs Creek (L); rises in Plumas County in the northern part of T. 25 N., R. 10 E. (altitude 5,000 feet above sea level); flows northwestward 4 miles to junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); one-half mile south of Crescent Mills; fall, 1,500 feet. Indian Valley special map.

Howard Creek (R); rises in Sierra County in the southeastern part of T. 21 N., R. 12 E., at altitude 7,100 feet above sea level; flows irregularly southward into North Fork of North Fork of Yuba River (Sierra City branch; tributary through North Fork of Yuba River to Yuba River and thus through Feather River and the Sacramento); length, 5 miles; fall, 1,400 feet. Downieville sheet.

Hulen Creek (L); rises in Shasta County, in the northwestern part of T. 30 N., R. 6 W., at altitude 1,400 feet; flows in a general southerly direction about 5 miles into the North Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River); fall, 700 feet. Red Bluff sheet.

Humbug Creek (R); Nevada County; rises in the central part of T. 18 N., R. 10 E., at altitude 4,700 feet above sea level; flows southwestward 7 miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 2,500 feet. Colfax sheet.

Humbug Creek (L); Placer County; rises in the northwestern part of T. 15 N., R. 12 E., at altitude 5,200 feet above sea level; flows southwestward 2 miles, then northwestward 2½ miles into North Fork of American River (tributary through American River to the Sacramento) at Humbug Bar; fall, 3,000 feet. Colfax sheet.

Humbug Creek (R); Plumas County; rises near the center of T. 23 N., R. 13 E., on eastern slope of Grizzly Peak at altitude 6,000 feet above sea level; flows southward into Middle Fork of Feather River (tributary through Feather River to the Sacramento) which it enters at the lower end of Humbug Valley; length, about 5 miles; fall, 1,700 feet, of which 1,500 feet occurs in 1½ miles at head. Downieville sheet.

Humbug Creek (L); Sierra County; rises in the east-central part of T. 19 N., R. 9 E., at altitude 4,500 feet above sea level; flows eastward 3 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); fall, 2,100 feet; tributary, Little Humbug Creek. Downieville sheet.

Humbug Creek, Little (L); rises in Sierra County, in the central part of T. 19 N., R. 9 E., at altitude 4,700 feet above sea level; flows west 2 miles, then north 1 mile into Humbug Creek (tributary to North Fork of Yuba River which flows through Middle Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); fall, 1,500 feet. Downieville sheet.

Hungry Creek (R); rises in Plumas County, in Taylor Lake, in the southern part of T. 27 N., R. 11 E., at altitude 6,850 feet above sea level; flows somewhat north of east 2 miles, thence southwestward 4½ miles to junction with Indian Creek (tributary to North Fork of Feather River and thus through Feather River to the Sacramento); fall, about 2,400 feet. Indian Valley special map.

Hunters Creek (R); Eldorado County; rises in the eastern part of T. 12 N., R. 13 E., at altitude 5,500 feet above sea level; flows southwestward 2 miles into Silver Creek (tributary through Silver Fork to South Fork of American River and thus through American River to the Sacramento); fall, 900 feet. Pyramid Peak sheet.

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Hunters Creek (R); Glenn County; rises in T. 18 N., R. 5 W.; flows east and southeast, and discharges into Colusa Basin south of Logans Creek; intermittent. Sheet C, Sacramento Valley map.

Hunters Creek (R); Plumas County; rises near the center of T. 22 N., R. 7 E., at altitude 5,200 feet above sea level; flows southeastward into Middle Fork of Feather River (tributary through Feather River to the Sacramento); 2 miles long; fall, 3,100 feet. Bidwell Bar sheet.

Hutchinson Creek (L); rises in Yuba County in the northwestern part of T. 15 N., R. 6 E., at altitude about 300 feet above sea level; takes a general southwesterly course to its junction with Reeds Creek (tributary to Plumas Lake), east of Feather River; about 12 miles long; fall, 200 feet. Wheatland and Ostrom sheets.

Inconstance Creek; rises in Siskiyou County, on the north slope of Mount Shasta, at altitude 9,000 feet above sea level; flows northward about 4 miles, and then sinks into the lava beds through which its water percolates southward, joining the underground drainage tributary through springs to McCloud River (tributary to Pit River and thus to the Sacramento). Shasta sheet.

Indiana Creek (L); rises in Yuba County in the northeastern part of T. 18 N., R. 7 E., on the western slope of Oregon Hills, at altitude 2,500 feet above sea level; flows southward 2 miles then northwestward 1½ miles into Dry Creek (tributary through Yuba River to Feather River and thus to the Sacramento); fall, 950 feet. Smartsville sheet.

Indian Creek (R); Colusa County; rises in the northwestern part of T. 16 N., R. 6 W.; flows eastward 3 miles, then nearly north 7 miles to junction with Little Stony Creek (tributary through Stony Creek to Sacramento River) near Zachary. Punnett's map of Glenn and Colusa counties.

Indian Creek (L); Eldorado County; rises in the east-central part of T. 10 N., R. 10 E., 2½ miles southwest of Placerville at altitude 1,600 feet above sea level; flows somewhat north of west 5 miles into Webber Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 600 feet. Placerville sheet.

Indian Creek (L); Placer County; rises in the northern part of T. 15 N., R. 12 E., at altitude 5,300 feet above sea level; flows somewhat west of south about 9 miles into Eldorado Creek (tributary to North Fork of Middle Fork of American River, which flows to Middle Fork of American River and thus through American River to the Sacramento); fall, 3,100 feet. Colfax sheet.

Indian Creek (L); Placer County; rises in the southern part of T. 15 N., R. 10 E., at altitude 4,000 feet above sea level; flows southeastward 8 miles into North Fork of American River (tributary through American River to the Sacramento) 3½ miles southeast of Colfax; fall, 2,900 feet, of which 1,000 feet occurs in about 2 miles just above the mouth. Colfax sheet.

Indian Creek (L); rises in Plumas County, in the northeastern part of T. 28 N., R. 11 E., on south slope of Diamond Mountain at altitude 6,300 feet above sea level; flows southward about 16 miles to the west end of Genesee Valley, thence very irregularly westward about 36 miles to its junction with the North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 4,000 feet.

Indian Valley, through which this creek flows, is the best tract of farming land in Plumas County. A reservoir site was surveyed for the Reclamation Service in August and September, 1905. Gaging station at Crescent Mills 1905–1909. Drainage area, 733 square miles; estimated run-off from drainage area, 600,000 acre-feet.[1]

Indian Valley special map, Honey Lake and Lassen Peak sheets.

Indian Creek (L); Shasta County; rises in the northwestern part of T. 35 N., R. 4 W., at altitude 2,500 feet above sea level; flows southwestward 1 mile, then westward 1 mile into Sacramento River; fall, 1,500 feet. Redding sheet.

[1] Fourth Annual Report of the Reclamation Service 1904–1905, Washington 1906, page 93.

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Indian Creek (R); Sierra County; rises in the northeastern part of T. 18 N., R. 9 E., at altitude 4,300 feet above sea level; flows southwestward into Middle Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); length, 5 miles; fall, 2,100 feet. Colfax sheet.

Indian Creek, Little (R); rises in Colusa County, in the southern part of T. 16 N., R. 6 W.; flows northward about 5 miles into Indian Creek (tributary to Little Stony Creek and thus through Stony Creek to the Sacramento). Punnett's map of Glenn and Colusa counties.

Indian Spring Creek (R); rises in Nevada County in the northwestern part of T. 15 N., R. 7 E., at altitude 1,700 feet above sea level, on the northeast slope of Indian Springs Hill (altitude 2,231 feet); encircles the north base of the hill and then flows southward to its junction with Dry Creek (tributary through Feather River to the Sacramento) at the north foot of Iron Mountain; length, 7 miles; fall, 1,000 feet. Smartsville sheet.

Inks Creek (L); rises in Tehama County, in the eastern part of T. 29 N., R. 2 W., at altitude 800 feet above sea level; flows southwestward about 6 miles into Sacramento River 2 miles below Jellys Ferry; fall, about 400 feet. Red Bluff sheet.

Inskip Creek (L); rises in Butte County, in the central part of T. 25 N., R. 4 E., at altitude 4,900 feet above sea level; flows south of west about 3 miles into East Fork of Butte Creek (tributary through Butte Creek to Butte Basin); fall, 2,000 feet. Chico sheet.

Iowa Canyon Creek (L); rises in Eldorado County, in the southwestern part of T. 1 N., R. 12 E., at altitude 3,700 feet above sea level; flows north of west 6 miles into south fork of American River (tributary through American River to the Sacramento); fall, 2,000 feet. Placerville sheet.

Iowa Canyon Creek, Little (L); rises in Eldorado County in the southern part of T. 11 N., R. 12 E., at altitude 3,700 feet above sea level; flows northwestward 3 miles into Iowa Canyon Creek (tributary through South Fork of American River to American River and thus through American River to the Sacramento); fall, 1,200 feet. Placerville sheet.

Irish Creek (R); rises in Eldorado County, near Garden Valley, where it is formed by the junction of Manhattan and Empire creeks; flows southeastward 2 miles, then southwestward 2 miles into South Fork American River (tributary through American River to the Sacramento); fall below forks, 1,100 feet; tributaries, Dutch and Johntown creeks. Placerville sheet.

Island Lake; Nevada County, southern part of T. 18 N., R. 12 E.; outlet, South Fork Canyon Creek to Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); elevation, 6,900 feet above sea level; fall of outlet, 1,000 feet. Colfax sheet.

Jack Creek (R); rises in Butte County, in the northern part of T. 21 N., R. 5 E., at altitude 2,300 feet above sea level; flows southeastward into French Creek (tributary through North Fork of Feather River and Feather River to the Sacramento); less than a mile long; fall, 600 feet. Bidwell Bar sheet.

Jackson Creek (R); rises in Plumas County, in the east central part of T. 23 N., R. 12 E., at altitude 6,900 feet above sea level; flows westward 5½ miles to junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento) near Cromberg; fall, 2,500 feet; tributary, Cogswell Creek. Downieville sheet.

Jackson Creek (R); rises in Nevada County, in the southeastern part of T. 19 N., R. 13 E., in Jackson Lake, at altitude 6,650 feet above sea level; flows north of west 1 mile then southwestward 1¼ miles into Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento) three-fourths mile above the head of Bowman Lake; fall, 1,000 feet. Colfax sheet.

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Jackson Lake; Nevada County, southwestern part of T. 19 N., R. 13 E., on northwest slope of Long Mountain; outlet Jackson Creek to Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); altitude, 6,650 feet; fall of outlet, 1,000 feet. Colfax sheet.

Jackson Slough; Sacramento County, extending southward from old Sacramento River at Isleton to Sevenmile Slough, between Sacramento and San Joaquin rivers. Sacramento Valley map.

Jacobs Creek (L); rises in Eldorado County in the eastern part of T. 11 N., R. 9 E., at altitude 1,500 feet above sea level; flows northwest 1 mile, north 1 mile, then east 1 mile into South Fork of American River (tributary through American River to the Sacramento); fall, 800 feet. Placerville sheet.

Jamison Creek; rises in Plumas County, in the southern part of T. 22 N., R. 11 E., at altitude 7,000 feet above sea level; takes a general northeasterly course to its junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento) in the southwestern part of T. 23 N., R. 12 E.; length, 10 miles; fall, 2,700 feet; principal tributaries, Little Jamison, Eureka, and Squirrel creeks. Downieville sheet.

Jamison Creek, Little (R); rises in Plumas County, in Jamison Lakes in the northeastern part of T. 21 N., R. 11 E., at altitude 6,350 feet above sea level; flows northward 3 miles into Jamison Creek (tributary through Middle Fork of Feather River and Feather River to the Sacramento); fall, about 1,000 feet. Downieville sheet.

Jamison Lakes (two); Plumas County, northeastern part of T. 21 N., R. 11 E.; one inlet; outlet Little Jamison Creek to Jamison Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); elevation of upper lake, about 6,300 feet above sea level; elevation of lower lake, 6,200 feet. The connecting stream is less than one-eighth mile long and in the half mile between the lower lake and Grass Lake Little Jamison Creek falls about 300 feet. Downieville sheet.

Jaybird Creek (R); rises in Eldorado County, near the center of T. 11 N., R. 11 E., at altitude 2,400 feet above sea level; flows southward 1½ miles into South Fork of American River (tributary through American River to the Sacramento); fall, 1,000 feet. Placerville sheet.

Jericho Creek (L); rises in Lake County, in the southeastern part of T. 12 N., R. 6 W.; flows southeastward 4 miles, then somewhat west of south 3 miles to its junction with Putah Creek (tributary to Yolo Basin) on the boundary between Napa and Lake counties. Punnett's map of Lake County.

Jerusalem Creek (L); rises in Lake County, in the southern part of T. 13 N., R. 6 W.; flows southward 8 miles into Putah Creek (tributary to Yolo Basin) in the eastern part of T. 11 N., R. 6 W.; tributary, Morgan Valley Creek. Punnett's map of Lake County.

Jerusalem Creek (R); rises in Shasta County, in T. 31 N., R. 8 W., on the south slope of Bully Choop Mountain, at altitude 5,000 feet above sea level; flows southeastward about 8 miles, then northeastward 2 miles into North Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River); fall, 4,200 feet. Red Bluff sheet.

Jim Crow Ravine Creek (L); rises in Sierra County, near the center of T. 19 N., R. 11 E., at altitude 5,500 feet above sea level; flows northwestward into North Fork of Yuba River (tributary to Middle Fork Yuba and thus through Yuba River to Feather River and the Sacramento); length, 5 miles; fall, 2,400 feet. Downieville sheet.

Johns Creek (R); rises in Shasta County, near the center of T. 34 N., R. 4 W., on east slope of O'Brien Mountain, at altitude 1,200 feet above sea level; flows southeastward into McCloud River (tributary to Pit River and thus to the Sacramento) at Baird; length, 1½ miles; fall, 500 feet. Redding sheet.

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Johnson Canyon Creek (L); rises in Eldorado County, in the southeastern part of T. 11 N., R. 11 E., at altitude 2,800 feet above sea level; flows west of north into North Canyon Creek (tributary through South Fork of American River to American River and thus to the Sacramento); length, 1½ miles; fall, 1,000 feet. Placerville sheet.

Johntown Creek (R); rises in Eldorado County, in the western part of T. 12 N., R. 10 E., at altitude 2,050 feet above sea level; flows southeastward 4 miles into Irish Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 900 feet. Placerville sheet.

Jones Ravine Creek (L); rises in Nevada County, in the northwestern part of T. 16 N., R. 8 E., at altitude 1,900 feet above sea level; flows northwestward 1 mile into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 900 feet. Smartsville sheet.

Jordan Creek (R); rises in Nevada County, in the northwestern part of T. 17 N., R. 12 E., in Fuller Lake, at altitude 5,250 feet above sea level; flows southward 1½ miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 750 feet. Colfax sheet.

Joseph Creek (L); rises in eastern part of Modoc County, on Cedar Peak, at altitude about 6,000 feet above sea level; flows westward 8 miles into the North Fork of Pit River, which is tributary through Pit River to the Sacramento; fall, 1,300 feet. Alturas sheet.

Kanaka Creek (L); rises in Butte County, in the western part of T. 24 N., R. 4 E., at altitude 4,000 feet above sea level; flows southwestward 1 mile then northward and westward 2 miles into East Fork of Butte Creek (tributary through Butte Creek to Butte Basin); fall, 1,500 feet; tributary Clear Creek. Chico sheet.

Kanaka Creek (R); rises in Sierra County, in the eastern part of T. 19 N., R. 10 E., at altitude 5,500 feet above sea level; flows southeastward into Middle Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); length, 10 miles; fall, 3,400 feet. Colfax sheet.

Kanaka Creek, Little (R); rises in Sierra County, in the eastern part of T. 19 N., R. 10 E., at altitude 5,000 feet above sea level; flows southward 2 miles into Concow Creek (tributary through Middle Fork of Yuba River and Yuba River to Feather River and thus to the Sacramento); fall, 600 feet. Colfax sheet.

Kaiser Creek (R); rises in Butte County, in the southwestern part of T. 25 N., R. 5 E., on the southern slope of Bald Hill, at altitude 5,700 feet above sea level; flows southeastward 3 miles into Kimshew Creek (tributary to West Branch of Feather River and thus through North Fork of Feather River to Feather River and the Sacramento); fall, 1,400 feet. Bidwell Bar sheet.

Kaseberg Creek (L); rises in Placer County, in the southern part of T. 11 N., R. 6 E., just north of Roseville, at altitude 150 feet above sea level; flows northwestward 3½ miles into Pleasant Grove Creek (tributary to American Basin); channel tortuous; fall, about 50 feet; intermittent. Roseville sheet.

Kelsey Creek (R); rises in Lake County, in the northern part of T. 11 N., R. 8 W., on the eastern slope of the Coast Range; flows northwestward 9 miles, then somewhat east of north 8 miles into Clear Lake (outlet, Cache Creek to Yolo Basin). Punnett's map of Lake County.

Kentucky Ravine Creek (L); rises in Nevada County, in the western part of T. 16 N., R. 8 E., at altitude 2,000 feet above sea level; flows southwestward 5 miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento) at Bridgeport; fall, 1,400 feet. Smartsville sheet.

Kettle Rock Creek (L); rises in Plumas County, in the northern part of T. 26 N., R. 11 E., on the southern slope of Kettle Rock, at altitude 7,000 feet above sea level; flows southwestward about 2 miles into Peters Creek (tributary to Lights Creek which

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flows through Indian Creek to the North Fork of the Feather and thence through Feather River to the Sacramento); fall, 2,500 feet. Indian Valley special map.

Keystone Creek (L); rises in Yuba County, in the western part of T. 18 N., R. 7 E., at altitude 1,700 feet above sea level; flows northwestward one-half mile into Maple Grove Creek (tributary through Indiana Creek to Dry Creek which flows through Yuba River to the Feather and thus to the Sacramento); fall, 100 feet. Smartsville sheet.

Keystone Ravine Creek (L); rises in Sierra County, in the northwestern part of T. 19 N., R. 12 E., on the west slope of Keystone Mountain, at altitude 6,500 feet above sea level; flows northwestward 2 miles into North Fork of Yuba River (tributary to Middle Fork of Yuba and thus through Yuba and Feather rivers to the Sacramento); fall, 2,500 feet. Downieville sheet.

Kidds Lakes. See *Cascade Lakes*.

Kimshew Creek (L); rises in Butte County, in the southern part of T. 25 N., R. 5 E., 2 miles north of Table Mountain, at altitude 6,000 feet above sea level; flows very irregularly southwestward into West Branch of Feather River (tributary to North Fork of Feather River and thus through Feather River to the Sacramento); length, 10 miles; fall, 3,300 feet; principal tributaries, Little Kimshew, Kaiser and Little Rock creeks. Bidwell Bar sheet.

Kimshew Creek, Little (L); rises in Butte County, in the southern part of T. 25 N., R. 5 E., on the east slope of Table Mountain, at altitude 5,900 feet above sea level; flows southward 4 miles, westward one-half mile into Kimshew Creek (tributary to West Branch of Feather River and thence through North Fork of Feather River and Feather River to the Sacramento); fall, 1,800 feet. Bidwell Bar sheet.

Kingsley Gulch Creek (L); rises in Tehama County, in the southwestern part of T. 27 N., R. 1 W., at altitude 1,300 feet above sea level; flows southwestward 6½ miles into Antelope Creek (tributary to Sacramento River) in the southern part of Rio de los Berrendos Rancho; fall, 1,070 feet, of which 950 feet occurs in the gulch; intermittent. Tehama sheet.

Kirk Lake; Sutter Basin, Sutter County, 1 mile south of Kirkville; a permanent water body about 1 mile long, very narrow and peculiarly curved. Dunnigan sheet.

Knickerbocker Creek (L); rises in Eldorado Canyon, in the western part of T. 12 N., R. 9 E., at altitude 1,450 feet above sea level; flows southeastward 2 miles into North Fork of American River (tributary through American River to the Sacramento); fall, 1,000 feet. Sacramento sheet.

Knownothing Creek (R); rises in Butte County, in the southeastern part of T. 27 N., R. 7 E., at altitude 4,100 feet above sea level; flows somewhat west of south to junction with South Fork of Feather River (tributary to Middle Fork of Feather and thus through Feather River to the Sacramento); length, 3½ miles; fall, 1,500 feet. Bidwell Bar sheet.

Koak Creek (R); rises in Shasta County, in the northeastern part of T. 38 N., R. 1 E., at altitude 4,000 feet above sea level; flows southwesterly 8 miles, then almost due south 5 miles to its junction with Pit River (through which it is tributary to Sacramento River); fall, 2,300 feet; gaging station at Henderson, 1910–11. Modoc Lava Bed sheet.

Lack Creek (L); rises in Shasta County, in the southern part of T. 31 N., R. 2 W., at altitude 3,200 feet above sea level; flows westward into Bear Creek (tributary to Sacramento River); length, 14 miles; fall, 2,700 feet, of which 1,200 feet occurs in the first 4 miles of course. Lassen Peak and Red Bluff sheets.

Kusal Slough; Butte County, Rancho Arroyo Chico; connects the lower part of Pine Creek with Mud Creek, through which it discharges into Chico Creek and the Sacramento. Chico Landing sheet.

Ladies Canyon Creek (R); Eldorado County; rises in the northern part of T. 10 N., R. 11 E., at altitude 2,700 feet; flows northwestward 3½ miles into South Fork of

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American River (tributary through American River to the Sacramento); fall, 1,500 feet. Placerville sheet.

Ladies Canyon Creek (R); Sierra County; rises in the western part of T. 20 N., R. 12 E., on the west slope of Sierra Buttes, at altitude 8,000 feet above sea level; flows southwestward 5 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba to Yuba River, and thus through Feather River to the Sacramento); fall, 4,500 feet. Downieville sheet.

Lady Canyon Creek (R); rises in Placer County, in the southeastern part of T. 14 N., R. 11 E., at altitude 3,000 feet above sea level; flows southward 2 miles into Middle Fork of American River (tributary through North Fork of American to American River and thus to the Sacramento); fall, 1,800 feet. Colfax sheet.

Laguna Creek (R); rises in Solano County, in the southeastern part of T. 6 N., R. 2 W., at altitude 1,000 feet above sea level; flows eastward 3 miles into Alamo Creek (tributary to Cache Slough, Yolo Basin); fall, about 700 feet. Napa sheet.

Lake of the Woods; Yuba County, one-fourth mile west of Feather River and one-half mile northwest of Bear River, formed by overflow from Feather and Bear rivers. This lake is about a mile long, its water surface is 27 feet above sea level. The ridge separating the lake from the river is about 8 feet high. Its waters are connected with those of Feather River only when the latter is in flood. Nicolaus sheet.

Laniger Lakes (4); Tehama County, T. 25 N., R. 1 W.; intermittent water bodies; elevation, 215 feet; no outlet shown on map, but lakes are probably at times connected with an intermittent stream flowing southwestward into the Sacramento opposite the lower end of Blethen Island. Vina sheet.

Lassen Creek (L); rises in the eastern part of Modoc County, on the western slope of Warner Mountains, at altitude 6,000 feet above sea level; flows northwestward about 12 miles into Goose Lake, which at exceptionally high stages may discharge into the North Fork of Pit River and thus through Pit River to the Sacramento; fall, 1,200 feet. Alturas sheet.

Last Chance Creek (L); Butte County; rises in the western part of T. 25 N., R. 5 E., at altitude 6,000 feet above sea level; flows southwestward about 7 miles into West Branch of Feather River (tributary to North Fork of Feather River and thus through Feather River to the Sacramento); fall, 2,600 feet. Bidwell Bar and Chico sheets.

Last Chance Creek (L); Plumas County; rises in the southern part of T. 23 N., R. 9 E., at altitude 5,000 feet above sea level; flows northwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 1 mile; fall, 1,800 feet. Downieville sheet.

Last Chance Creek (R); Plumas County; rises near the center of T. 25 N., R. 15 E., at altitude 7,300 feet above sea level; flows eastward 4 miles, then southward 16 miles to its junction with the Middle Fork of Feather River (tributary through Feather River to the Sacramento) near the east end of Sierra Valley; fall, 2,300 feet; for 2 miles or more above mouth flows in several interlacing channels; tributaries include streams from Adams Peak and Dixie Mountain. The only tributary named on the map is Frenchman Creek. This creek drains a larger area than is drained by any other headwater stream of the Middle Fork and may therefore be regarded as the continuation of that stream. Sierraville sheet.

Last Chance Creek (R); Plumas County; rises in the northeastern part of T. 25 N., R. 15 E., on east slope of McKesick Peak (altitude 7,085 feet) about 4 miles south of Honey Lake; flows irregularly westward 10 miles, then southward 4 miles into Squaw Creek (tributary to Red Clover Creek which flows through Indian Creek to the North Fork of Feather River to the Feather River and thence to the Sacramento); fall, 1,800 feet. Honey Lake sheet.

Lichen Creek (L); rises in Eldorado County, in the southeastern part of T. 12 N., R. 9 E., on the north slope of Mount Ararat, at altitude 2,000 feet above sea level;

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flows southwestward about 3 miles into Greenwood Creek (tributary through South Fork of American River to American River and thus to the Sacramento) at Magnolia; fall, 1,300 feet. Placerville sheet.

Lick Creek (R); rises in Shasta County, near the center of T. 35 N., R. 2. W., on the eastern slope of Brock Butte, at altitude 2,900 feet above sea level; flows southward 5 miles to junction with Pit River (tributary to Sacramento River); fall, 1,900 feet. Redding sheet.

Lights Creek (R); rises in Plumas County, in the northern part of T. 28 N., R. 11 E., on the west slope of Diamond Mountain (altitude 6,000 feet above sea level); flows somewhat west of south about 20 miles to junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento) at upper end of Indian Valley; fall, about 2,500 feet; principal tributaries, Surprise, Peters and Cook Canyon creeks. For lower 5 miles of course passes through north arm of Indian Valley. Honey Lake and Indian Valley special maps.

Lincoln Creek (L); rises in Sierra County, in the north central part of T. 20 N., R. 13 E., at altitude 7,000 feet above sea level; flows northwestward into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento) 1 mile west of Summit House; length, 3 miles; fall, about 700 feet; open meadow at head. Downieville sheet.

Linda Creek (L); rises in Placer County, in the northwestern part of T. 11 N., R. 8 E., 2 miles southeast of Newcastle, at altitude 800 feet above sea level; flows very irregularly southwestward about 26 miles and discharges into Bush Lake at the south end of American Basin; fall in the 11 miles above Roseville 700 feet; principal tributary Dry Creek (called Antelope Creek on the Sacramento and Fairoaks sheets). See Antelope and Arcade sheets.

Lindsey Lakes; Nevada County, central part of T. 18 N., R. 12 E., outlet a stream 1½ miles long flowing westward into Texas Creek (tributary through Canyon Creek to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); 4 small connected lakes, the lowest being 6,500 feet above sea level and the highest 6,650 feet; fall of outlet, above junction with Texas Creek, 1,000 feet. Colfax sheet.

Little. See name of main creek.

Logan Creek (R); rises in Glenn County, near the center of T. 19 N., R. 5 W.; flows southward about 3 miles, eastward 4 miles, and then takes a general southeasterly course; discharges into the Colusa Basin in the northern part of Colusa County; principal tributary, North Fork. Sheet C, Sacramento Valley map.

Logan Creek, North Fork (L); rises in Glenn County, in the eastern part of T. 19 N., R. 5 W.; flows southeastward into Logan Creek, which discharges into the Colusa Basin; intermittent. Sheet C, Sacramento Valley map.

Logtown Ravine Creek (L); rises in Eldorado County, in the northeastern part of T. 9 N., R. 10 E., near Logtown, at altitude 1,900 feet above sea level; flows northward 2 miles into Slate Creek (tributary through Dry Creek to Webber Creek, which flows through South Fork of American River to American River and thus to the Sacramento); fall, 400 feet. Placerville sheet.

Lone Rock Creek (R); rises in Plumas County, in the southeastern part of T. 28 N., R. 11 E., on the south slope of Lone Rock, at altitude 5,600 feet above sea level; flows southeastward 4 miles, thence eastward 3 miles into Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, about 900 feet. Lassen Peak sheet.

Long Canyon Creek (L); Eldorado County; rises in the southern part of T. 11 N., R. 12 E., at altitude 3,700 feet above sea level; flows north of west 5 miles into South Fork of American River (tributary through American River to the Sacramento); fall, 2,000 feet. Placerville sheet.

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Long Canyon Creek (R); Placer County; rises in the southern part of T. 14 N., R. 13 E., where it is formed by the junction of its north and south forks. The South Fork rises in the southern part of T. 15 N., R. 14 E., at altitude 7,000 feet above sea level and flows southwestward about 10 miles. The North Fork rises in the northwestern part of T. 14 N., R. 14 E., at altitude 6,500 feet above sea level and flows southwestward 6 miles. Below the junction this creek continues a southwesterly course for 5 miles to Rubicon River (tributary through Middle Fork of American to North Fork of American and thus through American River to the Sacramento); length to head of South Fork, about 20 miles; fall, 4,500 feet. The South Fork flows through Big Meadows. Truckee, Colfax, and Placerville sheets.

Long Gulch Creek (L); Butte County; rises in the west-central part of T. 24 N., R. 4 E., at altitude 4,200 feet above sea level; flows southward 5 miles into Little West Branch (Feather River) Creek (tributary to West Branch of Feather River, which flows through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 1,400 feet. Chico sheet.

Long Gulch Creek (L); Shasta County; rises in the western part of T. 33 N., R. 2 W., at altitude 1,400 feet above sea level; flows northwestward 1 mile into Pit River (tributary to Sacramento River); fall, 600 feet. Redding sheet.

Long Gulch Creek (L); Tehama County; rises in the southern part of T. 27 N., R. 1 W., at altitude 1,600 feet above sea level; flows in a general southwesterly course about 10 miles to junction with Antelope Creek (tributary to Sacramento River) in Rio de los Berrendos Rancho; fall, 1,340 feet, of which 1,300 feet occurs in the gulch; intermittent. Tehama sheet.

Long Lake; Plumas County; T. 21 N., between Rs. 11 and 12 E.; 2 inlets draining small lakes; outlet, Gray Eagle Creek to Middle Fork of Feather River (tributary through Feather River to the Sacramento); elevation, 6,700 feet above sea level; fall of outlet, 2,200 feet in 6 miles. Downieville sheet.

Long Lake; Sutter Basin, east side of Sacramento River in Sutter County, 6 miles southwest of Sutter City. A permanent water body in the marsh south of Butte Slough. Marysville sheet.

Long Valley Creek (R); Lake County; rises in the western part of T. 15 N., R. 8 W., 3 miles northeast of Morrison Landing on Clear Lake; flows southeastward about 11 miles to junction with the North Fork of Cache Creek (tributary through Cache Creek to Yolo Basin) ½ mile southeast of Arabella. Punnett's maps of Lake and Mendocino counties; Land Office map (1907).

Long Valley Creek (R); Plumas County; rises in the northeastern part of T. 23 N., R. 12 E., at altitude 7,000 feet above sea level, takes a general westerly course to its junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 8 miles; fall, 2,900 feet; tributaries, Bull Run and Little Long Valley creeks. Downieville sheet.

Long Valley Creek (R); Sierra County; rises in the southern part of T. 20 N., R. 13 E., at altitude 7,600 feet above sea level; flows southwestward 2 miles into South Fork of North Fork of Yuba River (tributary to North Fork of Yuba, which flows to Middle Fork of Yuba and thus through Yuba and Feather rivers to the Sacramento); fall, 1,900 feet. Downieville sheet.

Long Valley Creek, Little (R); rises in Plumas County, in the southern part of T. 24 N., R. 12 E., at altitude 6,900 feet above sea level; flows southeastward 4½ miles into Long Valley Creek (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); fall, 2,700 feet. Downieville sheet.

Loon Lake; Eldorado County, northeastern part of T. 13 N., R. 15 E.; outlet, Gerlé Creek to Little South Fork of Rubicon River (tributary through Rubicon River to Middle Fork of American River and thus through American River to the Sacramento); elevation, 1,560 feet; the northern arm of this lake is called Pleasant Lake. Truckee and Pyramid Peak sheets.

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Lost Canyon Creek (R); rises in Placer County, in the eastern part of T. 15 N., R. 12 E., at altitude 5,400 feet above sea level; flows southeastward 3 miles into North Fork of Middle Fork of American River (tributary through Middle Fork of American to North Fork of American and thus through American River to the Sacramento); fall, 2,000 feet. Colfax sheet.

Lost Creek (L); Plumas County; rises in the northwestern part of T. 21 N., R. 9 E., 3 miles northwest of La Porte, at altitude 5,800 feet above sea level flows southwestward to its junction with South Fork of Feather River (tributary through Middle Fork of Feather River and Feather River to the Sacramento) in Butte County, in the southeastern part of T. 20 N., R. 7 E.; length, 15 miles; fall, 3,500 feet; principal tributaries, Sly, Pinkard, and Eagle Gulch creeks. Downieville and Bidwell Bar sheets.

Lost Creek (L); Shasta County; rises in the northern part of T. 32 N., R. 3 E., on the south slope of Crater Peak, at altitude 6,700 feet above sea level; flows southeastward about 4 miles, then winds eastward to its junction with Hat Creek (tributary to Pit River and thus to the Sacramento) in the south-central part of T. 32 N., R. 4 E.; length, about 10 miles; fall, 2,200 feet. Lassen Peak sheet.

Lower Salmon Lake. See *Salmon Lakes, Upper and Lower.*

Lower Sardine Lake. See *Sardine Lakes, Upper and Lower.*

Lytton Lake; Nevada County, eastern part of T. 17 N., R. 15 E., near Summit; outlet a stream 1 mile long flowing southwestward to South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); elevation, 7,300 feet; fall of outlet, 500 feet. Truckee sheet.

McCabe Creek (L); rises in Butte County, in the northern part of T. 19 N., R. 6 E., 1½ miles west of Forbestown, at altitude 2,900 feet above sea level; flows westward 3 miles, then northwestward 2 miles into South Fork of Feather River (tributary to Middle Fork of Feather and thus through Feather River to Sacramento River); fall, 2,300 feet. Bidwell Bar sheet.

McCandless Gulch Creek (R); rises in Shasta County, in the eastern part of T. 34 N., R. 2 W., at altitude 2,100 feet above sea level; flows southeastward 2 miles into Cedar Creek (tributary through Little Cow Creek to Cow Creek, and thus to the Sacramento); fall, 800 feet. Redding sheet.

McCloud River (R); rises in Shasta County, in the northern part of T. 38 N., R. 1 E., at altitude (approximate) 5,000 feet above sea level; flows northward 5 miles into Siskiyou County (T. 39 N., R. 1 E.), then very irregularly westward 10 miles into T. 39 N., R. 2 W., then turns abruptly and takes a general southwesterly course to its junction with Pit River (tributary to Sacramento River) in Shasta County, in the southern part of T. 39 N., R. 4 W., 4 miles west of the mouth of the Pit; length, about 60 miles; fall, 4,200 feet; receives large supplies of water from springs issuing from the lava beds at the southern base of Mount Shasta; also direct surface drainage from the southern and eastern slopes of Mount Shasta through Squaw, Mud, Cold, and Ash creeks, its principal tributaries; drainage area, about 650 square miles; gaging station near Baird, 1910-11. Shasta and Redding sheets.

McClure Creek (R); rises in Tehama County, in the southern part of T. 25 N., R. 3 W., at altitude 320 feet above sea level; flows somewhat north of east about 6 miles into Saucos Rancho, where its channel connects with that of Truckee Creek, whose water sinks before reaching the Sacramento; fall, about 100 feet; intermittent. Tehama sheet.

McGriff Lakes (two); Sutter Basin, 1 mile east of Knights Landing, on east side of Sacramento; altitude 17 feet above sea level; permanent. Knights Landing sheet.

McMurray Lake; Nevada County, southern part of T. 19 N., R. 12 E., or northern part of T. 18 N., R. 12 E.; outlet by stream 3 miles long flowing northwestward into South Fork of Middle Fork of Yuba River (tributary through Middle Fork of Yuba River to Feather River and thus to the Sacramento); elevation, 5,800 feet above sea level. Colfax sheet.

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Mad Canyon Creek (R); rises in Placer County, in the central part of T. 14 N., R. 11 E., at altitude 3,400 feet above sea level; flows southwestward 2 miles into Middle Fork of American River (tributary through North Fork of American to American and thus to the Sacramento); fall, 2,200 feet. Colfax sheet.

Magpie Creek (L); rises in Sacramento County, in Rancho del Paso, 1 mile southwest of Antelope, at altitude 150 feet above sea level; flows southwestward about 6 miles, sinks before reaching Bush Lake in American Basin; fall, about 100 feet; intermittent. Arcade sheet.

Manhattan Creek (R); rises in Eldorado County, in the central part of T. 12 N., R. 10 E., at altitude 2,300 feet above sea level; flows southeastward 2½ miles, and unites with Empire Creek to form Irish Creek (tributary to South Fork of American River, and thus through American River to the Sacramento); fall, 400 feet. Placerville sheet.

Manzanita Creek (L); rises in Shasta County, in the southern part of T. 31 N., R. 4 E., on the west slope of Lassen Peak, at altitude 8,000 feet above sea level; flows northwestward about 5 miles, passing through Manzanita Lake to Deer Flat Creek (tributary through North Fork of Battle Creek to Battle Creek and thus to Sacramento River); fall, 3,200 feet. Lassen Peak sheet.

Manzanita Lake; Shasta County, in the southwestern part of T. 31 N., R. 4 E., northwest of Lassen Peak; inlet, Manzanita Creek; outlet, Manzanita Creek to Deer Flat Creek (tributary through North Fork of Battle Creek to Battle Creek and thus to Sacramento River); elevation, 5,600 feet. Lassen Peak sheet.

Maple Branch Mud Creek. See *Mud Creek, Maple Branch.*

Maple Grove Creek (L); rises in Yuba County, in the west central part of T. 18 N., R. 7 E., at altitude 2,500 feet above sea level; flows southwestward about 2 miles into Indian Creek (tributary through Dry Creek to Yuba River and thus through Feather River to the Sacramento); fall, 800 feet. Smartsville sheet.

Marble Creek (R); rises in Plumas County, near the center of T. 23 N., R. 6 E., on the south slope of Soapstone Hill, at altitude 5,300 feet above sea level; flows somewhat east of south 7 miles to its junction with Little North Fork of Feather River (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento) in Butte County, in the southeastern part of T. 22 N., R. 6 E.; fall, 2,400 feet. Bidwell Bar sheet.

Markham Ravine Creek (L); rises in Placer County, in the northeastern part of T. 12 N., R. 6 E., about 3 miles northeast of Lincoln, at altitude 250 feet above sea level; flows south of west about 18 miles (in a straight line) and discharges into American Basin through Bunkham Slough; intermittent. The channel followed by this creek is exceedingly tortuous and the length by the stream course is much greater than that in a straight line. Lincoln, Sheridan, Nicolaus, and Vernon sheets.

Mary Lake; Placer County, western part of T. 17 N., R. 15 E., on northwest slope of Donner Peak; outlet to South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); elevation, 7,050 feet above sea level. Truckee sheet.

Mary Lake; Sutter Basin, Sutter County, $\frac{1}{16}$ mile east of Sacramento River, 1 mile south of McGriff Lakes; elevation, 17 feet above sea level. Knights Landing sheet.

Massack Creek (R); rises in Plumas County in the southeastern part of T. 25 N., R 10 E., at altitude 5,000 feet above sea level; flows southwestward 1½ miles then north of west ½ mile to Spring Garden Creek (tributary to Spanish Creek, thence through Indian Creek to North Fork of Feather River, to Feather River, and into the Sacramento); fall, 1,400 feet. Downieville sheet.

Mathles Creek (L); rises in Shasta County, in the eastern part of T. 35 N., R. 3 W., on the west slope of Salt Creek Mountain, at altitude 3,900 feet above sea level; flows westward about 3 miles into McCloud River (tributary through Pit River to the Sacramento); fall, 2,800 feet. Redding sheet.

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Meadow Lake; Nevada County, central part of T. 18 N., R. 13 E., at Summit City outlet a stream 1 mile long flowing southward to Fordyce Lake (outlet, Fordyce Creek to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); elevation, 7,300 feet; fall of outlet, 1,000 feet. This lake is about a mile long and half a mile wide. Truckee sheet.

Meadow Creek, West (R); rises in Placer County in T. 14 N., R. 15 E., at altitude 7,500 feet above sea level; flows southwestward 2½ miles into Barker Creek (tributary through Rubicon to Middle Fork of American River and thus through North Fork of American and American rivers to the Sacramento); fall, 1,900 feet. Truckee sheet.

Mears Creek (R); rises in northwestern Shasta County, in the southern part of T. 38 N., R. 5 W., on the eastern slope of Trinity Mountains; flows southeastward about 5 miles to its junction with Sacramento River in the western part of T. 37 N., R. 4 W. Punnett's map of eastern part of Siskiyou County (1909); Denny's map of Shasta County.

Medora Lakes; Little and Big; Yolo Basin, northern part of Solano County, in the tidal marsh north of Miner Slough. Sheet P, Sacramento Valley map.

Meesick Lake. See *Plumas Lake*.

Middle Branch or Fork. See name of main stream.

Middle [Cache] Creek (L); Lake County; rises in the western part of T. 17 N., R. 10 W., on the eastern slope of the Coast Range; flows southeastward to Clear Lake (outlet Cache Creek to Yolo Basin). Punnett's map of Lake County.

Middle Creek (R); Shasta County; rises in the southeastern part of T. 32 N., R. 6 W., about 1,000 feet above sea level; flows eastward into Sacramento River near Waugh; length, 2½ miles; fall, 500 feet; intermittent. Redding sheet.

Middle Creek, East (L); rises in Lake County in the southeastern part of T. 16 N., R. 9 W., flows northwestward 7 miles, then turns abruptly and flows southwestward 3 miles to its junction with Middle Creek (tributary through Clear Lake to Cache Creek and thus to Yolo Basin). Punnett's map of Lake County.

Milk Ranch Creek (L); rises in Plumas County, in the northwestern part of T. 24 N., R. 7 E., at altitude 6,000 feet above sea level; flows westward 3 miles into North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 4,000 feet. Bidwell Bar sheet.

Mill Creek (L); Butte County; rises in the southwestern part of T. 23 N., R. 5 E., at altitude 4,000 feet above sea level; flows westward to junction with North Fork of Feather River (tributary through Feather River to the Sacramento); length, 4 miles; fall, 2,500 feet. Bidwell Bar sheet.

Mill Creek (L); Colusa County; rises in the western part of T. 16 N., R. 6 W.; flows southeastward 4 miles into Bear Creek. Punnett's map of Colusa County.

Mill Creek (R); Plumas County; rises in the northeastern part of T. 23 N., R. 9 E., at altitude 6,200 feet above sea level; flows northeastward 4 miles, then northwestward 2 miles to junction with Spanish Creek (tributary to Indian Creek and thence through North Fork of Feather River to the Feather River and into the Sacramento); fall, 2,800 feet, of which 2,000 feet occurs in the first 2 miles at head. Indian Valley special map.

Mill Creek (L); Shasta County; rises in the southern part of T. 30 N., R. 4 E., emerging from Crumbo Lake at altitude 7,500 feet above sea level; flows southward about 16 miles, then southwestward 16 miles to junction with Sacramento River in Rio de los Molinos Rancho; fall, 7,300 feet, of which 3,000 feet occurs in the first 4 miles of course; gaging station at Los Molinos, 1909. Lassen Peak and Tehama sheets.

Mill Creek (L); Yuba County; rises in the southeastern part of T. 19 N., R. 8 E., at altitude 3,500 feet above sea level; flows southeastward 5 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba River to Yuba River, Feather and Sacramento rivers); fall, 1,800 feet. Smartsville sheet.

Miller Canyon Creek (R); rises in Solano County, in the southwestern part of T. 7 N., R. 2 W., on the eastern slope of Vaca Mountains, at altitude 2,000 feet above

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sea level; flows somewhat north of east three miles into Pleasants Creek (tributary through Putah Creek to Yolo Basin); fall, about 1,600 feet. Napa sheet.

Millers Creek (R); rises in Eldorado County, in the south-central part of T. 14 N., R. 16 W., just south of the Placer and Eldorado County boundary line, at altitude 7,142 feet above sea level; flows south of west 3 miles into Rubicon River (tributary through Middle Fork of American River to North Fork of American and thus through American River to the Sacramento); fall, 642 feet. Truckee sheet.

Milton Creek (L); rises in Sierra County, in the western part of T. 19 N., R. 13 E., on the west slope of Bald Ridge, at altitude 6,000 feet above sea level; flows northwestward into the South Fork of North Fork Yuba River (tributary through North Fork of Yuba to Middle Fork of Yuba and thus through Yuba and Feather rivers to the Sacramento); length, 3 miles; fall, 1,100 feet. Downieville sheet.

Miner Slough; Yolo Basin, extending along the north side of Ryer Island between Cache Slough and Sutter Slough. Sacramento Valley map.

Missouri Canyon Creek (R); rises in Eldorado County, in the north-central part of T. 13 N., R. 11 E., at altitude 3,300 feet above sea level; flows southwestward 2½ miles into Otter Creek (tributary to Middle Fork of American River, which flows through North Fork of American and American rivers to the Sacramento); fall, 800 feet. Placerville sheet.

Modin Creek (L); rises in Shasta County, in the eastern part of T. 36 N., R. 2 W., at altitude 3,500 feet above sea level; flows southwestward about 2 miles into Squaw Creek (tributary to Pit River, which flows into Sacramento River); fall, about 1,400 feet; intermittent in upper course. Redding sheet.

Mohawk Creek (L); rises in Sierra County, in the northeastern part of T. 21 N., R. 13 E., at altitude 5,400 feet above sea level; flows northwestward 8 miles into Middle Fork of Feather River (tributary through Feather River to the Sacramento) which it enters in Plumas County in the southeastern part of T. 22 N., R. 12 E.; drains the upper end of Mohawk Valley; fall, 1,100 feet. Downieville sheet.

Moody Creek (R); rises in Shasta County, in the western part of T. 33 N., R. 4 W., on the south slope of Bass Mountain, at altitude 1,100 feet above sea level; flows southeastward 5 miles into the West Fork of Stillwater Creek (tributary through Stillwater Creek to Sacramento River); fall, about 400 feet; principal tributary, Rancheria Creek; intermittent. Redding sheet.

Moonlight Creek. See *Surprise Creek.*

Montgomery Creek (L); rises in Plumas County, in the eastern part of T. 25 N., R. 10 E., on the west slope of Grizzly Mountains, at altitude 6,800 feet above sea level; flows southwestward 1 mile, northward 1½ miles, and then northeastward 1 mile to junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 3,200 feet; encircles north end of Grizzly Mountain. Indian Valley special map.

Montgomery Creek (L); rises in Shasta County, in the northeastern part of T. 34 N., R. 1 E., 4,200 feet above sea level; flows northwestward 12 miles to its junction with Pit River, through which it is tributary to Sacramento River; fall, 2,900 feet. Lassen Peak sheet.

Monumental Creek (R); rises in Placer County, in the northeastern part of T. 16 N., R. 12 E., at altitude 6,300 feet above sea level; flows southeastward 3 miles to its junction with East Fork of North Fork of North Fork of American River, to American River, and thus to the Sacramento; fall, 1,800 feet. Colfax sheet.

Moonshine Creek (R); rises in Yuba County, in the central part of T. 18 N., R. 8 E., at altitude 2,200 feet above sea level; flows southward 3 miles into Middle Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); fall, 800 feet. Smartsville sheet.

Morgan Valley Creek (L); rises in Lake County, in the southeastern part of T. 13 N., R. 6 W., flows southeastward 3 miles, then in general southwestward 3 miles

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into Jerusalem Creek (tributary through Putah Creek to Yolo Basin). Punnett's map of Lake County.

Morrison Creek (L); rises in Rio de los Americanos Rancho, south of American River, at altitude 120 feet above sea level; flows southeastward into American Basin; intermittent. Fairoaks sheet.

Mormon Basin; a minor basin lying between Upper Sycamore Slough and the west bank of Sacramento River below the town of Sycamore. See *Colusa Basin*. Sheet E, Sacramento Valley map.

Morris Ravine Creek (R); rises in Butte County, in the southwestern part of T. 20 N., R. 4 E., at altitude 600 feet above sea level; flows southeastward 2 miles into Feather River (tributary to Sacramento River); fall, 400 feet. Chico sheet.

Mosquito Creek (L); Butte County; rises in the northern part of T. 21 N., R. 6 E., at altitude 3,500 feet above sea level; flows westward into French Creek (tributary to North Fork of Feather River and thus through Feather River to the Sacramento); length, 4 miles; fall, 2,100 feet. Bidwell Bar sheet.

Mosquito Creek (L); Butte County; rises in the northwestern part of T. 23 N., R. 4 E., at altitude 3,000 feet above sea level; flows southwestward 2 miles into Little Butte Creek (tributary through Butte Creek to Butte Basin); fall, 600 feet. Chico sheet.

Mosquito Creek (R); Eldorado County; rises in the center of T. 11 N., R. 11 E., at altitude 2,400 feet above sea level; flows southeastward 2 miles into South Fork of American River (tributary through American River to the Sacramento); fall, 1,000 feet. Placerville sheet.

Mosquito Creek (R); Plumas County; rises in western part of T. 26 N., R. 7 E., at altitude 5,300 feet above sea level; flows southward about 4 miles into North Fork of Feather River (tributary through Feather River to the Sacramento) 5 miles below the mouth of Butt Creek; fall, 2,900 feet. Lassen Peak sheet.

Mosquito Creek (R); Shasta County; rises in the southwestern part of T. 36 N., R. 5 W., on the eastern slope of Trinity Mountains, at altitude (approximate) 3,500 feet above sea level; flows eastward to its junction with Sacramento River half a mile north of Delta; length, about 3 miles; fall, 2,200 feet. Redding sheet (on which it is unnamed); Denny's map of Shasta County.

Mountain House Creek (R); rises in Butte County, in the northern part of T. 21 N., R. 6 E., near Mountain Cottage, at altitude 3,600 feet above sea level; flows northeastward 2½ miles into Little North Fork of Feather River (tributary to Middle Fork of Feather River and thus through Feather River to the Sacramento); fall, 1,400 feet. Bidwell Bar sheet.

Mud Creek (L); Butte County; formed in T. 23 N., R. 2 E., by the union of Maple and East branches; the East Branch is formed by the West and Middle branches; the Middle Branch, which may be considered the head of the stream, rises in the northwestern part of T. 24 N., R. 3 E., at altitude 3,700 feet above sea level, and flows southward 5 miles, descending in this distance, 1,500 feet, to its junction with the West Branch; from this junction the East Branch flows southwestward about 5 miles, descending 1,600 feet, to the point where it receives Maple Branch; below the mouth of Maple Branch the main creek continues in a southwesterly course about 12 miles, then turns and flows northwestward, discharging into the Sacramento through Big Chico Creek; connected with Pine Creek by Kusal Slough; length, about 22 miles; fall to head of Middle Branch, 3,500 feet. Chico sheet.

Mud Creek (R); Siskiyou County; rises on the southeastern slope of Mount Shasta, at altitude 8,000 feet above sea level; flows southward about 16 miles to its junction with McCloud River (tributary to Pit River and thus to the Sacramento); fall, 5,300 feet, of which 4,000 feet occurs in the upper 7 miles of course. Shasta sheet.

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Mud Creek, Maple Branch (R); rises in Butte County, in the eastern part of T. 24 N., R. 2 E., on the east slope of Keefer Ridge, at altitude 2,300 feet above sea level; flows southwestward about 5 miles, and unites with the East Branch to form Mud Creek (tributary to Sacramento River through Big Chico Creek); fall, 1,600 feet. Chico sheet.

Mud Creek, West Branch (R); rises in Butte County, in the northeastern part of T. 24 N., R. 2 E., on the east slope of Keefer Ridge, at altitude 3,500 feet above sea level; flows southward 4 miles, and unites with Middle Branch to form East Branch of Mud Creek (tributary through Mud Creek to the Sacramento); fall, about 1,300 feet. Chico sheet.

Murphy Lake; American Basin, east side Feather and Sacramento rivers, Sutter County, 2½ miles east of Feather River and 2 miles north of the Sacramento; a permanent water body about 4 miles long inclosed by levees. Vernon sheet.

Mutton Canyon Creek (L); rises in Eldorado County, near the center of T. 12 N., R. 12 E.; flows northeastward 2 miles into Pilot Creek (tributary through Rubicon River and Middle Fork of American River and thus through North Fork of American and American rivers to the Sacramento); fall, 500 feet. Placerville sheet.

Myrtle Creek (L); rises in the northeastern part of Modoc County, on the western slope of Warner Mountains, at altitude 6,000 feet above sea level; flows north of west about 4 miles into Goose Lake, which at exceptionally high stages may be tributary to the North Fork of Pit River and thus through Pit River to the Sacramento; fall, 1,200 feet. Alturas sheet.

Mystic Lake; Sutter Basin, Sutter County, one-fourth mile south of Horseshoe Lake and one-eighth mile east of the river. Dunnigan sheet.

Natchez Honcut Creek. See *Honcut Creek, Natchez.*

Nawtawakit Creek (R); rises in Shasta County, in the eastern part of T. 36 N., R. 4 W., on the western slope of Nawtawakit Mountain, 3,500 feet above sea level; flows southeastward 3½ miles into McCloud River (tributary through Pit River to the Sacramento); fall, 2,400 feet; intermittent. Redding sheet.

Negro Creek (L); rises in Nevada County, in the southeastern part of T. 16 N., R. 7 E., at altitude 1,800 feet above sea level; flows north of west into Bear Creek (tributary through Yuba River to Feather River and thus to the Sacramento); length 2½ miles; fall, 700 feet. Colfax sheet.

Negro Run (R); rises in Plumas County, in the eastern part of T. 22 N., R. 7 E., at altitude 5,100 feet above sea level; flows southward into South Branch of Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 1½ miles; fall, 500 feet. Bidwell Bar sheet.

Nelson Creek (R); Shasta County; rises in the southern part of T. 33 N., R. 5 W., at altitude 1,000 feet above sea level; flows southeastward 2 miles into Churn Creek (tributary to Sacramento River) 1 mile below Churntown; fall, about 250 feet; intermittent. Red Bluff and Redding sheets.

Nelson Creek (R); Shasta County; rises in the northeastern part of T. 37 N., R. 1 E., at altitude 4,600 feet above sea level; flows southwestward about 8 miles to its junction with Pit River (through which it is tributary to Sacramento River) 3 miles southeast of Henderson; fall, 2,900 feet; many small branches. Modoc Lava Bed sheet.

Nelson Creek (L); Plumas County; rises in the southeastern part of T. 22 N., R. 11 E., at altitude 7,000 feet above sea level; flows northwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 11 miles; fall, 2,100 feet; tributaries, East Branch and Poorman creeks. Downieville sheet.

Nelson Creek, East Branch (R); rises in Plumas County near the center of T. 22 N., R. 11 E., at altitude 7,000 feet above sea level; flows northwestward into

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Nelson Creek (tributary through Middle Fork of Feather River to Feather River and the Sacramento); length, 5 miles; fall, 2,400 feet. Downieville sheet.

Nelson Slough; Sutter Basin, extends southeastward into the basin from the right bank of Feather River 1½ miles west of Nicolaus. Nicolaus sheet.

New Creek (L); Tehama County, Rio de los Berrendos Rancho; one of several channels through which Antelope Creek reaches the Sacramento; New Creek leaves Antelope Creek at altitude about 310 feet above sea level, flows southwestward 3 miles, and enters the Sacramento through Salt Creek; fall, about 70 feet; intermittent. Tehama sheet.

New York Canyon Creek (R); Placer County; rises in the northern part of T. 14 N., R. 10 E., at altitude 3,000 feet above sea level; flows southwestward 2 miles into Shirttail Canyon Creek (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,200 feet. Colfax sheet.

New York Canyon Creek (L); Placer County; rises in the northern part of T. 15 N., R. 13 E., at altitude 5,500 feet above sea level; flows northward 2½ miles into North Fork of American River (tributary to Sacramento River) half a mile east of the mouth of Granite Creek; fall, 2,000 feet. Colfax sheet.

New York Creek (L); Eldorado County; rises in the southern part of T. 10 N., R. 8 E., at altitude 800 feet above sea level; flows southward 5 miles into South Fork of American River (tributary through American River to the Sacramento) 1 mile below Salmon Falls; fall, 400 feet. Sacramento sheet.

New York Creek (R); Yuba County; rises in the northern part of T. 19 N., R. 6 E., 1 mile northwest of New York Flat, at altitude 2,500 feet above sea level; flows southeastward 2 miles and unites with Slate Creek to form Dry Creek (tributary through Yuba River to Feather River and thus to the Sacramento); fall, 300 feet. Smartsville sheet.

Nigger Jack Slough (L); Yuba County; discharges into Feather River (and thus to the Sacramento) through Simmerly Slough, which it joins just north of Marysville; length, about 8 miles. Marysville sheet.

Nigger Slough; Sacramento County, Rancho del Paso; extends northeastward from a point one-eighth mile north of American River and one-half mile northeast of Sacramento. Brighton sheet.

North Branch or **Fork**. See name of main stream.

North Creek (R); rises in Nevada County, in the southeastern part of T. 18 N., R. 14 E., at altitude 7,200 feet above sea level; flows westward 5 miles into Fordyce Lake (outlet Fordyce Creek to South Fork of Yuba River which flows through Yuba River to Feather River and thus to the Sacramento); fall, 1,300 feet; numerous small tributaries, including stream from White Rock Lake. Truckee sheet.

North Salt Creek. See *Salt Creek, North*.

Norton Gulch Creek (L); rises in Shasta County, in the northeast part of T. 33 N., R. 2 W., at altitude 2,000 feet above sea level; flows southwestward 3 miles into Little Cow Creek (tributary to Cow Creek and thus to the Sacramento); fall, about 950 feet. Redding sheet.

Nosoni Creek (L); rises in Shasta County, in the northwestern part of T. 35 N., R. 2 W., at altitude 2,500 feet above sea level; flows westward about 5 miles into McCloud River (tributary through Pit River to the Sacramento); fall, 1,600 feet; tributary, North Fork. Redding sheet.

Nosoni Creek, North Fork (R); rises in Shasta County, in the southeastern part of T. 36 N., R. 3 W., at altitude 3,000 feet above sea level; flows southwestward 3½ miles into Nosoni Creek (tributary to McCloud River and thus through Pit River to the Sacramento); fall, 1,700 feet. Redding sheet.

Nye Creek (L); rises in Glenn County, in the northeastern part of T. 20 N., R. 6 W.; flows southeastward into the South Fork of Willows Creek (to Colusa Basin); intermittent; about 10 miles long. Sheet B, Sacramento Valley map.

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Oak Run (R); rises in Shasta County, in the northwestern part of T. 33 ., R. 1 W., at altitude 1,800 feet above sea level; flows southwestward to its junction with Cow Creek (tributary to Sacramento River); length, about 21 miles; fall, 1,300 feet. Redding sheet.

Oat Creek (R); rises in Yolo County, in the western part of T. 11 N., R. 2 W.; flows eastward 9 miles, then northeastward 3 miles into Colusa Basin; intermittent. Sacramento Valley map.

Oat Creek (R); rises in Tehama County, in the southeastern part of T. 26 N., R. 4 W., at altitude about 800 feet above sea level; flows somewhat south of east about 16 miles into Sacramento River in the eastern part of Las Flores Rancho; fall, 600 feet; intermittent. Tehama sheet.

O'Brien Creek (L); rises in Shasta County, near the central part of T. 34 N., R. 4 W., on the eastern slope of O'Brien Mountain, at altitude 1,500 feet above sea level; takes a circuitous but in general westerly course to its junction with the Sacramento in the eastern part of T. 34 N., R. 5 W.; length, about 4 miles; fall, 750 feet. Redding sheet.

Old Cortina Creek. See *Cortina Creek, Old.*

Old Cow Creek. See *Cow Creek.*

Olney Creek (L); rises in Shasta County, in the western part of T. 31 N., R. 5 W., at altitude 1,200 feet above sea level; flows southeastward and then southward; length, about 7 miles; fall, 800 feet, chiefly in upper part of course; intermittent, carrying water to Clear Creek (tributary to Sacramento River), to which its basin is tributary, only in times of flood. Redding sheet.

One Eye Creek (L); rises in Eldorado County, in the northwestern part of T. 11 N., R. 11 E., on the western slope of Slate Mountain, at altitude 3,500 feet above sea level; flows southwestward 3 miles then northwestward 2 miles into Rock Creek (tributary through South Fork of American River to American River and the Sacramento); fall, 1,700 feet. Placerville sheet.

Onemile Creek (R); Glenn and Colusa counties, Larkin Children's ranch; a floodwater channel, about 4½ miles long, extending southwestward into the Colusa Basin from the vicinity of Packer Island to a point 2 miles southwest of Princeton. Sheet C, Sacramento Valley map.

Onion Creek (R); Placer County; rises in the southwestern part of T. 17 N., R. 15 E., on the west slope of Mount Lincoln (altitude 8,403 feet); flows southwestward 3 miles into North Fork of American River (tributary to Sacramento River); fall, 2,000 feet. Truckee sheet.

Onion Creek (R); Tehama County; rises in the southern part of T. 28 N., R. 4 E., at altitude 4,700 feet above sea level; flows southeastward 2 miles into Deer Creek (tributary to Sacramento River); fall, 600 feet. Lassen Peak sheet.

Onion Valley Creek (R); Placer County; rises in the north-central part of T. 16 N., R. 12 E., at altitude 4,900 feet above sea level; flows southward into East Fork of North Fork of North Fork of American River (tributary through North Fork of American and American rivers to the Sacramento); length, 2 miles; fall, 500 feet. Colfax sheet.

Onion Valley Creek (L); Plumas County; rises in the north-central part of T. 22 N., R. 10 E., at altitude 7,000 feet above sea level; flows irregularly westward to its junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 10 miles; fall, 4,000 feet; many short tributaries of which the only one named on the map is Bird Creek. Downieville and Bidwell Bar sheets.

Orchard Creek (L); rises in Placer County, in the southwestern part of T. 12 N., R. 7 E., at altitude 500 feet above sea level; flows somewhat north of west 7 miles into Auburn Ravine (tributary through Bunkham Slough to American Basin); fall in 2 miles at head, 300 feet; fall to Auburn Ravine, 400 feet; intermittent. Sacramento sheet.

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Oregon Creek; rises in Sierra County, near the center of T. 19 N., R. 10 E., 1 mile north of Forest City, at altitude 5,000 feet above sea level; flows southwestward into Middle Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); length, 16 miles; fall, 3,600 feet. Colfax and Smartsville sheets.

Oregon Gulch Creek (R); Butte County; rises in the northern part of T. 20 N., R. 4 E., 1 mile north of Oregon City, at altitude 1,500 feet above sea level; flows southward into Feather River (tributary to Sacramento River); length, 6 miles; fall, 1,200 feet. Chico sheet.

Oregon Gulch Creek (R); Shasta County; rises in the central part of T. 31 N., R. 5 W., at altitude 800 feet above sea level; flows eastward into Sacramento River 3 miles below Redding; fall, 200 feet; intermittent. Redding sheet.

Oroleave Creek (L); rises in Butte County, in the southeastern part of T. 20 N., R. 7 E., 1 mile south of Clipper Mill, at altitude 3,700 feet above sea level; flows northwestward into South Fork of Feather River (tributary to Middle Fork of Feather River and thus through the Feather to Sacramento River); length, 4 miles; fall, 1,900 feet. Bidwell Bar sheet.

Otter Creek (L); rises in Eldorado County, in the southeastern part of T. 13 N., R. 11 E., near Kentucky Flat, at altitude 4,000 feet above sea level; flows in general somewhat north of west into Middle Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); length, 8 miles; fall, 3,000 feet. Placerville sheet.

Owl Creek (L); Nevada County; rises in the northeastern part of T. 16 N., R. 7 E., at altitude 2,100 feet above sea level; flows northwestward 2 miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 700 feet. Smartsville sheet.

Owl Creek (L); Placer County; rises in the northern part of T. 13 N., R. 10 E., at altitude 2,800 feet above sea level; flows somewhat south of west about 3 miles into North Fork of American River (tributary through American River to the Sacramento); fall, 1,900 feet, of which 1,000 feet occurs in ½ mile just above mouth. Colfax sheet.

Owl Gulch Creek (R); rises in Yuba County, in the southeastern part of T. 20 N., R. 8 E., at altitude 3,500 feet above sea level; flows southeastward 2 miles into Deadwood Creek, a tributary of North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 1,000 feet. Bidwell Bar sheet.

Packer Lake; Sierra County, northwestern part of T. 20 N., R. 12 E.; 1 inlet; outlet a stream 2 miles long flowing in general eastward to the stream connecting Lower Salmon Lake with the North Fork of Yuba River (tributary to Yuba River and thus through Feather River to the Sacramento); elevation 6,550 feet; fall of outlet, 600 feet. Called Parker Lake on Punnett's map of Sierra County. Downieville sheet.

Packer Slough (R); Glen County, Larkin Children's ranch, half a mile west of the river; a horseshoe-shaped slough encircling Packer Island. Sheet C, Sacramento Valley map.

Paine Creek (L); rises in Tehama County, in the extreme southwestern part of T. 29 N., R. 3 E., 4,000 feet above sea level; flows somewhat south of west about 27 miles to junction with Sacramento River in T. 28 N., R. 3 W.; fall, 3,700 feet, of which 3,200 feet occurs in upper half of course. Lassen Peak and Red Bluff sheets.

Palisade Creek (R); rises in Placer County, in the southern part of T. 17 N., R. 14 E., in one of the Cascade Lakes, at altitude 6,500 feet above sea level; flows somewhat west of south to its junction with North Fork of American River (tributary through American River to the Sacramento), which it enters near the head of the American River gorge at the east pass of Snow Mountain; length about 4 miles; fall, 1,400 feet. Truckee sheet.

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Panther Creek (R); rises in Siskiyou County, on the south slope of Mount Shasta, at altitude 7,600 feet above sea level; flows south and southeast; intermittent in lower course; water sinks into the lava beds at the base of the mountain and reappears as springs tributary to Squaw Creek (tributary to McCloud River, and thus through Pit River to the Sacramento); Shasta sheet.

Parker Creek (L); rises in the southeastern part of Modoc County, on the western slope of Warner Mountains, at altitude 7,500 feet above sea level; flows northwestward 15 miles into North Fork of Pit River, which is tributary through Pit River to the Sacramento; fall, about 3,000 feet. Alturas sheet.

Parker Lake. See *Packer Lake.*

Pats Gulch Creek (L); rises in Sierra County, in the east-central part of T. 21 N., R. 9 E., near Queen City, at altitude 5,000 feet above sea level; flows eastward 1½ miles into Slate Creek (tributary to North Fork of Yuba River which flows through Middle Fork of Yuba, Yuba, and Feather rivers to the Sacramento); fall, 800 feet. Downieville sheet.

Peavine Creek (L); rises in Placer County, in the northeastern part of T. 14 N., R. 12 E., at altitude 5,500 feet above sea level; flows southeastward 5½ miles, northeastward 1 mile, and south of west 2 miles into North Fork of Middle Fork of American River (tributary through Middle Fork of American River to North Fork of American River and thus through American River to the Sacramento); fall, 3,500 feet, of which 2,000 feet occurs in 2 miles. Colfax sheet.

Peters Creek (L); rises in Plumas County in the southern part of T. 27 N., R. 11 E., at altitude 7,200 feet above sea level; flows southwestward about 7 miles to junction with Lights Creek (tributary through Indian Creek to North Fork of Feather River and thus through Feather River to the Sacramento); length, about 7 miles; fall, 3,700 feet. Indian Valley special map.

Petroleum Creek (R); rises in Yolo County in the northern part of T. 12 N., R. 3 W.; flows northeastward to Colusa Basin; intermittent. Sheet F, Sacramento Valley map.

Phoenix Lake; Nevada County, southeastern part of T. 18 N., R. 13 E., on north slope of Old Man Mountain; outlet a stream one-half mile long flowing westward to an unnamed southward-flowing stream which discharges into Fordyce Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); elevation, 7,300 feet. Colfax sheet.

Pigeon Roost Canyon Creek (R); rises in Placer County, in the southwestern part of T. 13 N., R. 13 E., at altitude 4,400 feet above sea level; flows southwestward 2 miles into Rubicon River (tributary through Middle Fork of American River to North Fork of American River and thus through American River to the Sacramento); fall, 1,800 feet. Placerville sheet.

Pilot Creek (L); rises in Eldorado County, in the northwestern part of T. 11 N., R. 9 E., on Pilot Hill, at altitude 1,600 feet above sea level; flows in general northwestward into North Fork of American River (tributary through American River to the Sacramento); length, about 3 miles; fall, 1,300 feet. Sacramento sheet.

Pilot Creek (L); rises in Eldorado County, in the southeastern part of T. 13 N., R. 13 E., at altitude 5,700 feet above sea level; flows southwestward 5 miles, westward 4 miles, northward 6 miles, then east of north 1½ miles into Rubicon River (tributary through Middle Fork of American River to North Fork of American River and thus through American River to the Sacramento); length, about 16 miles; fall, 3,300 feet. This creek closely parallels the great southward bend of the Rubicon, at an average distance of less than 2 miles. Placerville sheet.

Pine Creek (R); Modoc County; southeastern part; rises on the western slope of Warren Peak, Warner Mountains, at altitude 7,000 feet above sea level; flows northwesterly about 16 miles to its junction with South Fork of Pit River (tributary, through Pit River, to the Sacramento); fall, approximate, 2,500 feet. Alturas sheet.

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Pine Creek (L); Plumas County; rises in the northwestern part of T. 24 N., R. 6 E., at altitude 6,000 feet above sea level; flows 5 miles into Rock Creek (tributary through North Fork of Feather River to Feather River into the Sacramento). Fall, 3,700 feet. Bidwell Bar sheet.

Pine Creek (R); Plumas County; rises in the southern part of T. 25 N., R. 11 E., on the south slope of Grizzly Mountain (altitude 7,500 feet above sea level); flows southward 5 miles then westward 2 miles into Spring Garden Creek (tributary to Spanish Creek and thence through Indian Creek to the North Fork of Feather River to Feather River and into the Sacramento); tributary, Squirrel Creek; fall, 3,700 feet, of which 2,500 feet occurs in the first 4 miles. Downieville sheets.

Pine Creek (L); rises in eastern Tehama County, in the southeastern part of T. 25 N., R. 2 E., about 3,000 feet above sea level; flows southwestward 19 miles, then very irregularly southward 6 miles into Sacramento River; total fall, 2,890 feet, of which 2,600 feet occurs in the first 12 miles of course; tributaries, Camel, Singer, and Rock creeks, and many smaller intermittent streams; intermittent below foothill region; connected with Mud Creek by Kusal Slough. Chico and Vina sheets.

Pine Timber Gulch Creek (L); rises in Shasta County, in the western part of T. 31 N., R. 1 W., at altitude 1,600 feet above sea level; flows northwestward 2 miles into South Fork of Cow Creek (tributary through Cow Creek to Sacramento River); fall, 300 feet; intermittent. Redding sheet.

Pinkard Creek (R); Butte County; rises in the northwestern part of T. 20 N., R. 8 E., at altitude 3,800 feet above sea level; flows southwestward 3 miles into Lost Creek (tributary to South Fork Feather River and thus through Middle Fork Feather and Feather River to the Sacramento); fall, 800 feet. Bidwell Bar sheet.

Pinkard Creek (L); Plumas County; rises in the southwestern part of T. 22 N., R. 8 E., on the west slope of Cammel Peak, at altitude 5,000 feet above sea level; flows somewhat south of west to junction with South Branch of Middle Fork of Feather River (tributary through Feather River to the Sacramento); length, 5 miles; fall, 1,200 feet. Bidwell Bar sheet.

Pit River (L); formed near Alturas, in Modoc County, by union of North and South forks (q. v.); takes a general southwesterly course to its junction with Sacramento River about 12 miles north of Redding; elevation at lturas, about 4,500 feet; elevation at mouth, 687 feet; fall, 3,813 feet; fall between head of South Fork and mouth of main stream, about 7,300 feet; principal tributaries, Fall River, Squaw Creek, and McCloud River, from the north (right), and West Valley, Hat, Beaver, Ash, and Burney creeks from the south (left); drainage area, including Goose Lake basin, approximate, 6,290 square miles, or 22 per cent of the total area of the Sacramento River basin.

The greater part of the basin of Pit River exceeds 4,000 feet in elevation and consists chiefly of barren lava beds in the north and numerous small, flat, marshy meadows in the south. The area contains also many volcanic buttes and peaks, of which Mount Shasta (14,380 feet above sea level) and Lassen Peak (elevation, 10,437 feet) are the most important and are shared in common ith the upper Sacramento and Feather river basins.

About 50 per cent of the Pit basin is devoid of forest, the timberless area lying chiefly in the northeastern part. There are two well forested areas—one south of the Pit and north of Lassen Peak, and the other north of the Pit and south of Mount Shasta extending westward from Fall River and including the McCloud basin. All the public land in the forested area is included in Federal forest reserves.

Precipitation in this basin ranges from 10 inches annually in the upper eastern part, where it occurs largely as snow which at moderate altitudes soon melts, to 75 inches in the western and northwestern parts.

Numerous reservoir sites on the upper Pit and its tributaries have been surveyed by the United States Reclamation Service. The basin also affords exceptional opportunities for power development, especially below Fall River Mills. It is estimated

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that the Pit and its tributaries could develop about 1,000,000 horsepower continuously. About 50 per cent of this amount is commercially feasible of development and only about 2 per cent has been developed.

Gaging stations near Canby (1904–5), Bieber (1904–08), Henderson (1910–1911), and Silverthorne Ferry (1910–11).

Alturas, Modoc Lava Bed, Lassen Peak, Red Bluff, and Redding sheets.

Pit River, North Fork (R); rises in eastern Modoc County, about half a mile south of Goose Lake (q. v.), at altitude 4,800 feet above sea level; flows irregularly southward about 16 miles to Alturas, where it unites with the South Fork to form Pit River, which flows into the Sacramento; fall, about 250 feet; principal tributaries, Swedrengen, Joseph, and Parker creeks. Alturas sheet.

Topographically Goose Lake belongs to the drainage of the North Fork of the Pit, but normally it discharges no water to the river. It is said that in 1881, during a severe storm from the north, it overflowed to the river for two hours.

Pit River, South Fork (L); rises in Modoc County, on the western slope of Warner Mountains, about half way between Warren and Eagle peaks, at altitude 8,000 feet above sea level; flows southwestward 10 miles, passing through Clear Lake, then westward about 10 miles, then turns and flows northward through a swampy valley to Alturas, where it unites with the North Fork to form Pit River, through which it is tributary to the Sacramento; length, about 36 miles; fall, 3,550 feet, of which 3,400 feet occurs in the first 15 miles of course; principal tributaries, West Valley (Clark) Fitzhugh, and Pine creeks. Gaging station near Ivy, 1904–5. Alturas sheet.

On Starkweather's map of Lassen County the name "South Fork of Pit River" is applied to the stream flowing northward from the south base of South Fork Peak.

Pleasant Grove Creek (L); rises in Placer County, in the northeastern part of T. 11 N., R. 7 E., at altitude 200 feet above sea level; flows very irregularly eastward about 12 miles into American Basin, 1½ miles south of Pleasant Grove station; intermittent; channel tortuous. Roseville, Pleasant Grove, and Vernon sheets.

Pleasant Grove Creek, South Branch (L); rises in Placer County, in the southeastern part of T. 11 N., R. 6 E., 1 mile north of Roseville, at altitude 175 feet above sea level; flows northwestward to Pleasant Grove Creek (tributary to American Basin; length, about 4 miles; fall, 75 feet; intermittent. Roseville sheet.

Pleasant Lake, Eldorado County. See *Loon Lake*.

Pleasants Creek (R); rises in Solano County, in the southeastern part of T. 7 N., R. 2 W., at altitude 425 feet above sea level; flows somewhat east of north about 5 miles into Putah Creek (tributary to Yolo Basin); flows through Pleasants Valley; tributary, Miller Canyon Creek. Napa sheet.

Plum Creek (L); rises in Eldorado County, in the western part of T. 10 N., R 14 E., at altitude 5,900 feet above sea level; flows northwestward 6 miles into South Fork of American River (tributary through American River to the Sacramento); fall, 2,700 feet. Pyramid Peak sheet.

Plumas Lake; Yuba County, southwestern part of T. 14 N., R. 4 E., just west of Feather River; a slough-like lake which receives the drainage from Reeds Creek and other intermittent streams south of the mouth of Yuba River and north of Dry Creek. An arm of this lake called Messick Lake extends northwestward from a point near its western end. The lake is exceedingly irregular in shape. Ostrom sheet.

Poorman Creek (L); in Nevada County; rises in the eastern part of T. 15 N., R. 9 E., at altitude 2,900 feet above sea level; flows southwestward 2 miles into Greenhorn River (tributary through Bear River to Feather River and thus to the Sacramento); fall, 800 feet. Colfax sheet.

Poorman Creek (R); Nevada County; rises in the northeastern part of T. 18 N., R. 11 E., at altitude 6,500 feet above sea level; flows southwestward 10 miles to junction with South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 4,000 feet. Colfax sheet.

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Poorman Creek (L); Plumas County; rises in the northern part of T. 22 N., R. 10 E., at altitude 6,500 feet above sea level; flows northeastward into Nelson Creek (tributary through Middle Fork of Feather River to the Sacramento); fall, 2,100 feet. Downieville sheet.

Pope Creek (R); rises in Napa County in the southwestern part of T. 10 N., R. 6 W.; flows somewhat south of east about 16 miles into Putah Creek (tributary to Yolo Basin); Punnett's map of Napa County.

Poplar Creek (L); rises in Plumas County, in the southwestern part of T. 23 N., R. 11 E., at altitude 6,300 feet above sea level; takes a general northeasterly course into Middle Fork of Feather River (tributary through Feather River to the Sacramento) 2 miles west of Cromberg; length, about 5 miles; fall, 2,600 feet, of which 1,800 feet occurs in about three-fourths mile at head; tributaries Little Poplar and Camp creeks. Downieville sheet.

Poplar Creek, Little (R); rises in Plumas County, in the northern part of T. 22 N., R. 11 E., at altitude 5,700 feet above sea level; flows irregularly northward to its junction with Poplar Creek (tributary through Middle Fork of Feather River to Feather River and the Sacramento); length, 2 miles; fall, 1,200 feet. Downieville sheet.

Potem Creek (R); rises in Shasta County, in the northern part of T. 35 N., R. 2 W., on the north slope of Brock Butte, at altitude 2,800 feet above sea level; flows northeastward 2 miles, then southeastward 5½ miles to its junction with Pit River (tributary to Sacramento River); fall, 1,800 feet. Redding sheet.

Potter Creek (L); rises in Shasta County, in the eastern part of T. 34 N., R. 4 W., on the western slope of Horse Mountain, at altitude 2,000 feet above sea level; flows southwestward into McCloud River (tributary through Pit River to the Sacramento) at Baird; length, 1½ miles; fall, 1,300 feet. Redding sheet.

Poverty Gulch Creek (L); rises in Shasta County, in the central part of T. 29 N., R. 7 W., about 1,200 feet above sea level; flows southeastward 3 miles into Middle Fork of Cottonwood Creek (tributary through Cottonwood Creek to the Sacramento); fall, about 400 feet. Red Bluff sheet.

Powderhorn Creek (L); rises in Placer County, in the northwestern part of T. 14 N., R. 16 E., at altitude 8,000 feet above sea level; flows northwestward about 2½ miles into Five Lakes Creek (tributary to Rubicon River and thus through Middle Fork of American River to North Fork of American, American, and Sacramento rivers); fall, 1,500 feet. Truckee sheet.

Powell Creek (L); rises in Butte County, in the eastern part of T. 19 N., R. 5 E., at altitude 1,500 feet above sea level; flows northward 3 miles into South Fork of Feather River (tributary to Middle Fork of Feather and thus through Feather River to the Sacramento); fall, 900 feet. Bidwell Bar sheet.

Powell Slough; Colusa County, extends from a point 2 miles west of Colusa southeastward about 5 miles. A northeastern arm is called Hopkins Slough. Sheets D and E, Sacramento Valley map.

Prairie Creek (L); rises in Yuba County, in the southeastern part of T. 17 N., R. 5 E., at altitude 300 feet above sea level; flows westward into South Honcut Creek (tributary through Honcut Creek to Feather River and thus to the Sacramento); length, 8 miles; fall, about 200 feet. Smartsville and Marysville sheets.

Price Hollow Creek (L); rises in Shasta County, in the southeastern part of T. 33 N. R. 2 W., at altitude 1,400 feet above sea level; flows southwestward 3 miles into Cow Creek (tributary to Sacramento River); fall, about 800 feet; intermittent. Redding sheet

Prospect Slough; Yolo Basin, west of Miner Slough and east of Shag Slough, a branch of Cache Slough. Sacramento Valley map.

Putah Creek (R); rises in the St. Helena Range, on the eastern slope of the Coast Range, in the northern part of T. 11 N., R. 7 W.; flows southeastward into Yolo Basin near Davis; length about 80 miles; basin long and narrow, being 20 miles wide at

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the north end and 20 miles wide at the east; drainage area 810 square miles; numerous tributaries that discharge heavily during floods but are practically dry during the summer; principal tributaries, Soda Creek from the north and Pope Creek from the west.

The basin includes the southern part of Lake County, the northern half of Napa and small parts of Yolo and Solano counties. The topography of the basin is very rugged. Altitudes range from about 100 feet in Sacramento Valley to about 5,000 feet on the mountain slopes. The lower parts of the area are comparatively barren of timber, though they support a considerable growth of grass and brush which extends down as far as the foothills. At lower elevations timber grows scatteringly and the mountain summits are covered by a fairly heavy timber growth.

Mean annual precipitation averages about 28 inches along the foothills, 40 inches in the central part, and about 65 inches along the crest of the divide, where some of it occurs as snow. The annual precipitation at Helen Mine, on the northern slope of Mount St. Helena, is almost 100 inches annually.

Below the foothills is a large area of rich irrigable land. At least two good reservoir sites exist on the main stream, one near Winters and the other near Guenoc. Only a small amount of power could be developed continuously in the basin without storage because of the torrential nature of the streams. By utilizing the storage sites, however, many thousand horsepower can be developed.

Surveys and data: Punnett's maps of Mendocino and Lake counties, Sacramento Valley map.

Putah Creek Sinks; Yolo Basin, 6 miles southwest of Sacramento, a marshy area which receives the waters from Putah Creek. Sheet L, Sacramento Valley map.

Putah Creek, South Fork; Yolo Basin, not a tributary of Putah Creek but the south channel through which the waters of the creek enter Putah Creek Sinks. Sheet L, Sacramento Valley map.

Ramshorn Creek (R); rises in Sierra County, in the southwestern part of T. 20 N., R. 10 E., at altitude 5,000 feet above sea level; flows southward 2 miles into North Fork of Yuba River (tributary to Middle Fork of Yuba, and thus through Yuba and Feather rivers to the Sacramento); fall, 2,300 feet. Downieville sheet

Rancheria Creek (L); rises in Shasta County, in the western part of T. 32 N., R. 4 W., on the south slope of Bass Mountain, at altitude 1,500 feet above sea level; flows southward into Moody Creek (tributary to West Fork of Stillwater Creek and thus through Stillwater Creek to the Sacramento); length, 2 miles; fall, 700 feet; intermittent. Redding sheet.

Randolph Canyon Creek (R); rises in Eldorado County, in the northern part of T. 10 N., R. 11 E., near Oak Grove, at altitude 2,500 feet above sea level; flows westward 1 mile and southwestward 2 miles into Hangtown Creek (tributary through Webber Creek to South Fork of American River and thus through American River to the Sacramento) at Placerville; fall, 800 feet. Placerville sheet.

Randolph Canyon Creek (L); rises in Eldorado County, in the southwestern part of T. 11 N., R. 13 E., at altitude 4,200 feet; flows northwestward 1 mile into South Fork of American River (tributary through American River to the Sacramento); fall, 1,700 feet. Placerville sheet.

Rasor Lakes; Glenn County, Larkin Children's ranch; six small intermittent water bodies lying between the channels of Willows and Bounde creeks. Sheet C, Sacramento Valley map.

Rasor Slough; Glenn County, Larkin Children's ranch, three-fourths mile west of the Sacramento and one-half mile north of Packer Slough. Sheet C, Sacramento Valley map.

Rattlesnake Creek (R); Modoc County, northern part; rises on the east slope of Timbered Mountain, at altitude (approximate) 5,300 feet above sea level; flows southeasterly into Pit River, a tributary of the Sacramento; length, about 20 miles; fall, 750 feet; intermittent in upper 16 miles of course. Alturas sheet.

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Rattlesnake Creek (L); Nevada County; rises in the northeastern part of T. 15 N., R. 8 E., at altitude 2,600 feet above sea level; flows southeastward into Wolf Creek (tributary through Bear Creek to Feather River and thus to the Sacramento); length, about 5 miles; fall, 900 feet. Smartsville sheet.

Rattlesnake Creek (R); Nevada County; rises in the northwestern part of T. 17 N., R. 14 E., at altitude 7,500 feet above sea level; flows southwestward into South Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento); length, 6 miles; fall, 1,800 feet. Truckee and Colfax sheets.

Rattlesnake Creek (R); Plumas County; rises in the southeastern part of T. 24 N., R. 11 E., on the south slope of Grizzly Mountain, at altitude 6,200 feet above sea level; flows southwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento) just below the mouth of Long Valley Creek; length, 4 miles; fall, 2,100 feet. Downieville sheet.

Rattlesnake Creek (L); Sierra County; rises in the eastern part of T. 20 N., R. 10 E., on the south slope of Rattlesnake Peak, at altitude 6,500 feet above sea level; flows southwestward into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba to Middle Fork of Yuba, and thus through Yuba River to Feather River and the Sacramento), Downieville branch; length, 4 miles; fall, 2,300 feet. Downieville sheet.

Rattlesnake Creek (L); Tehama County; rises in the northern part of T. 24 N., R. 1 E., on the southern slope of Camel Mound, at altitude 2,000 feet above sea level; flows southwestward about 8 miles into Singer Creek (tributary to Pine Creek and thus to the Sacramento); fall, 1,700 feet, of which 1,300 feet occurs in the first 4 miles of course. Chico sheet.

Read Creek (R); rises in Tehama County, in the southern part of T. 27 N., R. 6 W., at altitude 1,000 feet above sea level; flows eastward and enters Sacramento River just below Red Bluff; length, 20 miles; fall, 700 feet; principal tributary, North Fork; lower course intermittent. Red Bluff and Tehama sheets.

Read Creek, North Fork (L); rises in Tehama County, in the eastern part of T. 27 N., R. 6 W., at altitude 900 feet above sea level; flows southeastward 7 miles into Read Creek (tributary to Sacramento River); fall, 500 feet. Red Bluff and Tehama sheets.

Red Bank Creek (R); rises in Tehama County, in the northern part of T. 25 N., R. 8 W., on the eastern slope of Yolla Bolly Mountains, at altitude 2,000 feet above sea level; flows somewhat south of east about 30 miles to junction with Sacramento River 2 miles below Red Bluff; fall, 1,700 feet; intermittent in lower course. Red Bluff and Tehama sheets.

Redbird Creek (R); rises in Eldorado County, in the eastern part of T. 11 N., R. 11 E., at altitude 2,900 feet above sea level; flows west of south 2 miles into South Fork of American River (tributary through American River to the Sacramento); fall, 1,200 feet. Placerville sheet.

Red Clover Creek (L); rises in Plumas County, in the southwestern part of T. 24 N., R. 15 E., at altitude 7,100 feet above sea level; flows northeastward through Red Clover Valley to its junction with Indian Creek (tributary to Indian Creek through North Fork of Feather River to Feather River and thence to the Sacramento) 2 miles above mouth; length about 18 miles; fall 3,400 feet; principal tributaries Dixie and Squaw creeks. Sierraville, Downieville, Honey Lake, and Indian Valley special sheets.

Reeds Creek (L); rises in Yuba County, in the northeastern part of T. 15 N., R. 5 E., at altitude 300 feet above sea level; flows southwestward into Plumas Lake whose waters are connected with Feather River only when the latter overtops the confining levees. The creek is about 18 miles long and its fall of 260 feet occurs almost entirely in the upper 6 miles; intermittent. Smartsville and Marysville sheets; also Wheatland and Ostrom sheets.

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Refuge Canyon Creek (R); rises in Placer County, in the northern part of T. 14 N., R. 10 E., at altitude 2,800 feet above sea level; flows southward into New York Canyon Creek (tributary to North Fork of American River and thus through American River to the Sacramento); fall, 900 feet. Colfax sheet.

Rice Creek (R); rises in Tehama County, in T. 26 N., R. 6 W.; flows eastward; intermittent; water sinks in Capay Rancho, a mile or more west of the Sacramento. Vina sheet.

Ringgold Creek (L); rises in Eldorado County, in the south-central part of T. 10 N., R. 11 E., at altitude 2,500 feet above sea level; flows southwestward 1½ miles, then northwestward 2 miles into Webber Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 1,100 feet. Placerville sheet.

Rio de los Berrendos (L); rises in Tehama County, in the southwestern part of T. 27 N., R. 1 E., at altitude 1,800 feet above sea level; flows southwestward about 13 miles into Antelope Creek (tributary to Sacramento River); fall, about 1,600 feet, of which 1,450 feet occurs in the upper 9 miles; intermittent; tributary, Wildcat Creek. Tehama sheet.

Roaring River (R); rises in Shasta County, in the southwestern part of T. 30 N., R. 7 W., at altitude 4,000 feet above sea level; flows southward 4 miles, then southeastward 12 miles into North Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River); fall, 3,200 feet; principal tributary, Crow Creek. Red Bluff sheet.

Rock Bound Lake; Eldorado County, in the northwestern part of T. 13 N., R. 16 E.; one inlet; outlet a stream one-fourth mile long flowing westward into Buck Island Lake (outlet to Rubicon River and thus through Middle Fork of American and American rivers to the Sacramento); elevation above sea level, 6,550 feet; above Buck Island Lake, 150 feet. Pyramid Peak sheet.

Rock Creek (L); Butte County; rises in the southwestern part of T. 22 N., R. 5 E., at altitude 3,200 feet above sea level; flows southward 2 miles into North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,400 feet. Bidwell Bar sheet.

Rock Creek (L); Butte County; rises near the Butte-Tehama County boundary, in T. 2 N., R. 2 E., on the west slope of Keefer Ridge, at altitude 3,700 feet above sea level; flows southwestward about 22 miles into Pine Creek (tributary to the Sacramento); fall, 3,300 feet, of which 2,200 feet occurs in the first 6 miles of course and 1,000 feet more in the next 5 miles; intermittent below the foothill region. Chico sheet.

Rock Creek (R); Eldorado County; rises in the southern part of T. 13 N., R. 11 E., at altitude 3,500 feet above sea level; flows southward 8 miles, southwestward 2½ miles, then southeastward again 2 miles into South Fork of American River (tributary through American River to the Sacramento); length, 13 miles; fall, 2,200 feet; principal tributaries, Whaler Creek and West Fork of Rock Creek. Placerville sheet.

Rock Creek (R); Nevada County; rises in the northwestern part of T. 14 N., R. 7 E., at altitude 1,400 feet above sea level; flows southwestward 8 miles into Bear River (tributary through Feather River to the Sacramento); fall, 1,100 feet. This is the lowest tributa y received by the Bear from the foothills. Smartsville sheet.

Rock Creek (L); Nevada County; rises in the southeastern part of T. 17 N., R. 9 E., at altitude 3,900 feet above sea level; flows irregularly westward into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); length, 8 miles; fall, 2,400 feet. Colfax and Smartsville sheets.

Rock Creek (L); Placer County; rises in the southern part of T. 12 N., R. 7 E., at altitude 325 feet above sea level; flows north of west about 6 miles into Auburn Ravine (tributary through Bunkham Slough to American Basin); intermittent; channel very tortuous; fall, about 225 feet. Roseville sheet.

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Rock Creek (R); Plumas County; rises near the center of T. 25 N., R. 5 E., on the north slope of Table Mountain, at altitude 6,000 feet above sea level; flows southeastward about 8 miles into North Fork of Feather River (tributary through Feather River to the Sacramento); fall, about 4,300 feet; tributaries North Valley Creek and Pine Creek. Bidwell Bar sheet.

Rock Creek (R); Plumas County; rises in Echo Lake, in the southern part of T. 30 N., R. 7 E., at altitude 1,600 feet above sea level; takes a general southwesterly course to junction with Hamilton Branch of Feather River (tributary through North Fork of Feather River to the Sacramento). Lassen Peak sheet.

Rock Creek (R); Plumas County; formed in the southwestern part of T. 24 N., R. 9 E., by union of North and South forks, of which the South Fork may be considered the head of the main stream. The South Fork rises in the northern part of T. 23 N., R. 9 E., at altitude 6,000 feet above sea level; flows southwestward 3 miles, then west of north to the junction. Below the mouth of the North Fork the general course of the creek is northward until it enters Spanish Creek (tributary to Indian Creek and thence through the North Fork of Feather River to Feather River and into the Sacramento); length to head of South Fork, about 9 miles; fall, 2,500 feet. The South Fork passes through Dean Valley reservoir. Bidwell Bar and Downieville sheets.

Rock Creek (L); Shasta County; rises in the northeastern part of T. 30 N., R. 3 E., at altitude 7,000 feet above sea level; flows westward 12 miles into North Fork of Battle Creek (tributary through Battle Creek to Sacramento River); fall, about 4,600 feet, of which 3,600 feet occurs in the first 4 miles at head. Lassen Peak sheet.

Rock Creek (R); Shasta County; rises in the eastern part of T. 32 N., R. 6 W., at altitude 1,000 feet above sea; flows southeastward into Sacramento River 3 miles above Redding; fall, 500 feet. Redding sheet.

Rock Creek (R); Shasta County; rises in the southwestern part of T. 38 N., R. 3 E., at altitude 5,200 feet above sea level; flows southeastward 7 miles into Pit River (through which it is tributary to Sacramento River) 4 miles below Pecks; fall, 2,700 feet. Modoc Lava Bed sheet.

Rock Creek (L); Sierra County; rises in the eastern part of T. 19 N., R. 10 E., at altitude 5,400 feet above sea level; flows northwestward into North Fork Yuba River (tributary through Middle Fork Yuba to Yuba River, and thus through Feather River to the Sacramento) at Goodyears Bar; length, 6 miles; fall, 2,800 feet; tributary, Woodruff Creek; gaging station at Goodyears Bar, 1910–11. Downieville sheet.

Rock Creek (R); Sierra County; rises in the northwestern part of T. 20 N., R. 9 E., at altitude 5,000 feet above sea level; takes a very irregular but in general southwesterly course to its junction with Canyon Creek (tributary to North Fork of Yuba River through Middle Fork of Yuba, Yuba, and Feather rivers to the Sacramento); length 6 miles; fall, 2,300 feet. Downieville and Bidwell Bar sheets.

Rock Creek, Little (L); Butte County; rises in the southwestern part of T. 24 N., R. 5 E., at altitude 4,500 feet above sea level; flows southwest 2 miles, then north of west 2 miles, into Kimshew Creek (tributary to West Branch of Feather River and thus through North Fork of Feather River and Feather River to the Sacramento); fall, 1,800 feet. Bidwell Bar sheet.

Rock Creek, North Fork (R); Plumas County; rises in the southern part of T. 24 N., R. 9 E., at altitude 5,200 feet above sea level; flows westward about 4 miles, unites with South Fork to form Rock Creek (tributary to Spanish Creek and thence through Indian Creek to the North Fork of Feather River, Feather River, and the Sacramento); fall, 1,000 feet. Downieville and Bidwell Bar sheets.

Rock Creek, West Fork (R); Eldorado County; rises in the northwestern part of T. 12 N., R. 11 E., at altitude 3,000 feet above sea level; flows irregularly southward 8 miles into Rock Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 1,300 feet; tributaries Bear and Traverse creeks. Placerville sheet.

Rocky Honcut Creek. See *Honcut Creek, Rocky.*

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Rodeo Creek (R); rises in Tehama County, in T. 25 N., R. 3 W., on Kimball Plains, at altitude 300 feet above sea level; flows eastward about 3 miles into Saucos Rancho; water sinks about 1 mile west of Tehama; intermittent. Tehama sheet.

Round Tent Canyon Creek (L); rises in Eldorado County, in the eastern part of T. 11 N., R. 13 E., at altitude 4,500 feet above sea level; flows north of west 3 miles into Silver Creek (tributary through South Fork American River to American River and thus to the Sacramento); fall, 1,400 feet. Placerville sheet.

Round Valley Reservoir; Plumas County, T. 26 N., R. 9 E.; several small inlets; outlet, North Canyon Creek to Wolf Creek (tributary through Indian Creek to North Fork of Feather River and thence through Feather River to the Sacramento); altitude, 4,480 feet; 1½ miles long, one-half mile wide. Indian Valley special map.

Rubicon River (L); rises in Eldorado County, in the eastern part of T. 12 N., R. 16 E., 2 miles north of Pyramid Peak, at altitude 8,700 feet above sea level; flows northwestward for about 20 miles in a broad open valley, then southwest in a deep narrow canyon to the northeast corner of T. 14 N., R. 14 E., then northwestward again to its junction with the Middle Fork of American River (tributary through North Fork of American to American River and thus to the Sacramento) in the northern part of T. 13 N., R. 11 E.; including its major windings this river is nearly 50 miles long; forms the boundary between Placer and Eldorado counties; fall, 6,500 feet, an average of more than 130 feet per mile for the entire course. Pyramid Peak, Truckee and Placerville sheets. See also Pyramid Peak folio (No. 31), Geol. Atlas U. S., U. S. Geol. Survey, 1896.

Rubicon River, Little South Fork (L); rises in Eldorado County, in the southeastern part of T. 13 N., R. 16 E., at altitude 8,000 feet above sea level; flows in general south of west into Rubicon River (tributary through Middle Fork of American to North Fork of American and thus through American River to the Sacramento); length, about 13 miles; fall, about 4,400 feet; principal tributary Gerlé Creek, the outlet of Loon Lake. The upper part of these drainage basins contain many small glacial lakes. Truckee and Pyramid Peak sheets.

Rucker Lake; Nevada County, northwestern part of T. 17 N., R. 12 E.; outlet a stream 1½ miles long flowing southwestward into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); elevation, 5,450 feet above sea level; fall of outlet, 1,950 feet, of which 1,500 feet occurs in about three-fourths mile at the mouth. Colfax sheet.

Rush Creek (L); rises in Nevada County, in the northeastern part of T. 16 N., R. 8 E., about 2 miles west of Nevada City, at altitude 2,500 feet above sea level; flows northwestward 3½ miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 1,400 feet. Smartsville sheet.

Sabine Lake; Colusa County, 1¼ miles north of Colusa, one-half mile west of the river at Cobbs Bend; no outlet; elevation about 50 feet. Sheet D, Sacramento Valley map.

Sacramento Basin; east side of Sacramento River above the river delta and south of Sacramento city.

The basin is long and narrow and has been protected from annual inundation better than other portions of the submerged plains adjacent to Sacramento River. A ridge of relatively high ground approaching Sacramento River from the northeast at Freeport cuts it into upper and lower sections. About 35 square miles of the lower portion of this basin is less than 10 feet above low water of Suisun Bay and lies 10 to 15 feet lower than the elevation of extreme high water in the river channel. Through this depression by way of a drainage ditch to Snodgrass Slough, drainage waters from Sacramento City are delivered into branches of San Joaquin River and through this river into Suisun Bay.

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Sacramento Valley map. Report of Examining Commission on Rivers and Harbors to the Governor of California (C. T. Reed, C. E. Grunsky, J. J. Crawford, commissioners), Sacramento, 1890, pp. 63–64.

Sacramento River; rises in the southwest part of Siskiyou County, in the small lake on Mount Eddy, one of the peaks of Trinity Mountains, at altitude 6,600 feet above sea level; flows eastward 12 miles, then southward 370 miles to the head of Suisun Bay, 50 miles from San Francisco, where it unites with the San Joaquin; the combined waters pass westward through Carquinez Strait to San Pablo Bay, thence through San Francisco Bay and the Golden Gate to the Pacific Ocean.

The drainage area of the Sacramento comprises — square miles and is divisible, according to the elevation, into three parts—(1) the central region known as the Sacramento Valley, whose general elevation is less than 500 feet above sea level; (2) the foothill region, made up of hills and ridges ranging in altitude from 500 to 2,300 feet and cut by ravines and canyons of moderate depth; (3) the mountain region, in which altitudes exceed 2,300 feet.

The mountain ranges surrounding the basin belong to the Cordilleran system. The Sierra Nevada on the east has an average width of approximately 70 miles from the rim of the valley to the crest of the range, which lies only a few miles west of the eastern boundary of the State. This range terminates in Warner Mountains in the northeastern part of the State, a region presenting evidence of recent volcanic action. The western slope of the range is covered with vast beds of lava. In the vicinity of Mount Shasta and Lassen Peak, which are themselves the cones of extinct volcanoes, are many cones, craters, ashes, and lakes. To the west of the basin is the Coast Range, which has an average width of approximately 35 miles from the rim of the valley to the crest.

The Sacramento is joined by numerous tributaries from the east and the west. Those coming from the Sierra Nevada, of which the most important are Pit, Feather, and American rivers, flow almost southwest; those from the Coast Range flow, in general, eastward. Most of the streams from the Coast Range do not reach the Sacramento directly but become lost "in the intricate plexus of sloughs which meander through the tule lands bordering the main river. On the east also only the larger tributaries reach the Sacramento by a definite channel and often that is exceedingly tortuous." [1]

Of the total fall of the river—6,600 feet from source to sea level—5,913 feet occurs in the 56 miles above the mouth of Pit River and 447 feet more in the 67 miles between Pit River and Red Bluff, leaving only 240 feet of fall for the remaining 250 miles of course.

Above the mouth of Pit River the Sacramento is a comparatively small stream, flowing swiftly in a well-defined channel; below the Pit it becomes larger, and at Red Bluff, where it enters Sacramento Valley, it is a sluggish stream of small slope and small capacity. It is navigable to Red Bluff, 250 miles above its mouth.

Below the mouth of Stony Creek, for about 100 miles of its lower course, the Sacramento occupies a ridge 5 to 20 feet higher that the troughs of the nearly parallel flood basins on each side, which are 2 to 7 miles from the river. The channel capacity throughout this distance is less than one-third that necessary to carry ordinary floods. The levees that have been constructed to lessen or prevent overflow all fail at one or more places during extreme floods and some fail during ordinary floods.

The large overflow area on the west side of the Sacramento is divided into two basins—Colusa Basin on the north and Yolo Basin on the south—by a ridge of detritus brought down by Cache Creek. The flood area on the east side of the river is divided into four basins—called, from north to south, Butte, Sutter, American, and Sacramento—by Marysville Buttes and Feather and American rivers.

Gaging stations at Castella (1910), Antler (1910), Jellys Ferry, near Red Bluff (1895–1902), Iron Canyon near Red Bluff (1902–1910), Collinsville (1878–1885), and Sacramento (1904–1905).

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[1] Ransome, F. L., The Great Valley of California: Bull. Univ. California, vol. 1, 1893–1896, p. 379.

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Surveys and data: Topographic maps of the United States Geological Survey, and county maps of northern California, listed on page 00. Description abstracted from "Water resources of California, Part 1, Stream measurements in Sacramento River basin," Water-Supply Paper U. S. Geol. Survey No. 298.

Sacramento River, Middle Fork (L); rises in southern Siskiyou County, in the southwestern part of T. 40 N., R. 5 W., on the eastern slope of Trinity Mountains, 4 miles south of Mount Eddy, at elevation (approximate) 6,600 feet above sea level; flows eastward about 5 miles to its junction with Sacramento River; fall, 3,000 feet. Shasta sheet (on which it is not named); Punnett's map of eastern part of Siskiyou County (1909).

Sacramento River, North Fork (L); rises in southern Siskiyou County, in the northwestern part of T. 40 N., R. 5 W., on the eastern slope of Mount Eddy; flows southeastward about 5 miles to its junction with Sacramento River; a mountain torrent. Punnett Brothers' map of eastern part of Siskiyou County (1909).

Sacramento Slough; Sutter Basin, Sutter County; extends from Sacramento River at a point one-half mile west of the mouth of Feather River, irregularly northwestward a distance of 5 miles. Knights Landing sheet.

Sailor Ravine Creek (L); Placer County; rises in the northwestern part of T. 15 N., R. 14 E., at altitude 6,500 feet above sea level; flows west and then north into North Fork of American River (tributary to Sacramento River) opposite the west base of Snow Mountain; length, 4 miles; fall, 3,000 feet. Truckee and Colfax sheets.

Sailor Ravine Creek (R); Sierra County; rises in the central part of T. 20 N., R. 10 E., at altitude 5,000 feet above sea level; flows eastward 2 miles into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba to Middle Fork of Yuba, and thus through Yuba River to Feather River and the Sacramento) Downieville branch; fall, 1,800 feet. Downieville sheet.

Sailors Ravine Creek (R); rises in Placer County, in the eastern part of T. 13 N., R. 7 E., at altitude 1,200 feet above sea level; flows north of west 2 miles, then westward 2 miles into Doty Creek (tributary through Coon Creek to American Basin); fall, 800 feet, intermittent. Sacramento sheet.

Salmon Lakes, Upper and Lower; Sierra County, south-central part of T. 21 N., R. 12 E.; 2 small inlets; connected by a very short stream; outlet a stream 4 miles long, flowing southward to North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); elevation of upper lake 6,650 feet; of lower lake 6,500 feet; fall of outlet 1,200 feet. The outlet receives streams draining several small lakes, of which the largest are Upper and Lower Sardine Lakes. Downieville sheet.

Salt Creek (R); Colusa County; rises in the central part of T. 13 N., R. 3 W.; flows northeastward into Colusa Basin just south of Sand Creek; intermittent. Sheet E, Sacramento Valley map.

Salt Creek (R); Colusa County; rises in the northwestern part of T. 14 N., R. 4 W., at altitude 125 feet above sea level; flows northwestward into Colusa Basin about 5 miles south of west of Colusa; length 15 miles; intermittent. Sheet E, Sacramento Valley map.

Salt Creek (L); Glenn County; rises in the southern part of T. 21 N., R. 8 W.; flows eastward about 11 miles to junction with Stony Creek (tributary to Sacramento River) in the southern part of T. 21 N., R. 6 W.; flows in a narrow canyon. Punnett's map of Glenn and Colusa counties.

Salt Creek (R); Shasta County; rises in the northwestern part of T. 31 N., R. 5 W., at altitude 1,000 feet above sea level; flows northeastward into Sacramento River at Waugh; 2½ miles long; fall, 500 feet. Redding sheet.

Salt Creek (R); Shasta County; rises in the western part of T. 33 N., R. 2 W., at altitude 1,500 feet above sea level; flows southwestward about 6 miles into Little Cow Creek (tributary through Cow Creek to Sacramento River); fall, 950 feet; intermittent. Redding sheet.

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Salt Creek (L); Shasta County; rises in the western part of T. 33 N., R. 6 W., at altitude 1,000 feet above sea level; flows southward 4 miles into Churn Creek (tributary to Sacramento River); fall, 350 feet; intermittent. Redding sheet.

Salt Creek (R); Shasta County; rises in the western part of T. 35 N., R. 2 W., on the northeast slope of Salt Creek Mountain, 2,000 feet above sea level; flows southeastward 4 miles by general course into Squaw Creek, a tributary of Pit River (tributary to the Sacramento); fall, 900 feet. Redding sheet.

Salt Creek (L); Shasta County; rises in the southeastern part of T. 36 N., R. 4 W., at elevation (approximate) 3,000 feet above sea level; flows southwestward about 10 miles and then northwestward 1½ miles to its junction with Sacramento River in the southeastern part of T. 35 N., R. 5 W.; fall, about 2,000 feet; principal tributary, Fall Creek; many short, unnamed tributaries. Redding sheet.

Salt Creek (L); Tehama County; rises in the northwestern part of T. 27 N., R. 8 W., at altitude 2,000 feet above sea level; flows northeastward about 18 miles into the South Fork of Cottonwood Creek (tributary through Cottonwood Creek to Sacramento River); fall, about 1,300 feet. Red Bluff sheet.

Salt Creek (L); Tehama County; rises in the eastern part of T. 28 N., R. 2. W., 1 mile northeast of Tuscan Springs, at altitude 1,050 feet above sea level; flows southwestward 6½ miles, southward 1½ miles, then southeastward 3 miles, and unites with Sacramento River just above Blackberry Island; fall, 810 feet, of which 700 feet occurs in the first 4 miles of course; intermittent; principal tributaries, Little Salt and New creeks, the last named a channel of Antelope Creek (q. v.). Tehama sheet.

Salt Creek, Little (R); rises in Tehama County, in the southern part of T. 28 N., R. 2 W., near Tuscan Springs, at altitude 1,000 feet above sea level; flows southwestward 5 miles into Salt Creek (tributary to Sacramento River); fall, 730 feet, of which 680 feet occurs in the first 3 miles of course; intermittent. Tehama sheet.

Salt Creek, Middle (L); rises in Shasta County, in the southeastern part of T. 36 N., R. 4 W., at altitude 3,000 feet above sea level; flows southwestward to junction with Sacramento River in northeast part of T. 35 N., R. 5 W.; length, about 6 miles; fall, 2,000 feet; principal tributary, North Fork; many small tributaries unnamed on map. Redding sheet.

Salt Creek, Middle, North Fork of (R); rises in Shasta County, in the western part of T. 36 N., R. 4 W., at altitude (approximate) 2,500 feet above sea level; flows southward 2½ miles into Middle Salt Creek, which is tributary to the Sacramento River; fall, 1,300 feet; receives four short, unnamed streams. Redding sheet.

Salt Creek, North (L); rises in Shasta County, in the eastern part of T. 36 N., R. 4 W., at altitude 3,000 feet above sea level; flows northwestward to its junction with Sacramento River in T. 36 N., R. 5 W., about 1 mile south of Portuguese Flat; length, about 6 miles; fall, approximate, 1,800 feet; principal tributary North Fork, which enters from the right. Shasta and Redding sheets.

Salt Creek, North, North Fork (R); rises in Shasta County, in the northeastern part of T. 36 N., R. 4 W., on the western slope of Nawtawakit Mountain, at altitude 5,000 feet above sea level; flows irregularly westward to its junction with North Salt Creek 2 miles southwest of Portuguese Flat; length, about 5 miles; fall, 3,200 feet. Shasta and Redding sheets.

Salt Gulch Creek (R); rises in Glenn County, in the northwestern part of T. 20 N., R. 4 W.; flows southeastward into French Creek (tributary to South Fork of Willows Creek, which discharges through Willows Creek into the Colusa Basin); intermittent. Sheet B, Sacramento Valley map.

Sand Creek (R); rises in Colusa County, in the southwestern part of T. 13 N., R. 3 W.; flows very irregularly northeastward into Colusa Basin west of Sycamore Slough; intermittent. Sheet E, Sacramento Valley map.

Sardine Creek (R); rises in Young America Lake in Sierra County, near the center of T. 20 N., R. 12 E., on the northwest slope of Sierra Buttes, at altitude 6,700 feet

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above sea level; flows northeastward through Upper and Lower Sardine Lakes to the stream connecting Lower Salmon Lake with the North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); length, about 2 miles; fall, 1,000 feet. Downieville sheet.

Sardine Lakes, Upper and Lower; Sierra County, north-central part of T. 20 N., R. 12 E., at north base of Sierra Buttes; inlet Sardine Creek from Young America Lake; outlet Sardine Creek to North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); elevation of Upper Lake 6,050 feet, of Lower Lake 5,850 feet; fall of Sardine Creek below Lower Lake, about 200 feet. Downieville sheet.

Saxonia Lake; Sierra County, northwestern part of T. 20. N., R. 12 E.; outlet a stream less than a mile long, flowing northward to the outlet of Packer Lake, which discharges to North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus to Feather River and the Sacramento); elevation, 6,550 feet; fall of outlet, 300 feet. Downieville sheet.

Sayles Canyon Creek (L); rises in Eldorado County, in the southeastern part of T. 11 N., R. 17 E., at altitude 9,000 feet above sea level; flows northwestward into South Fork of American River (tributary through American River to the Sacramento); fall, 2,600 feet. Pyramid Peak sheet.

Scotchman Creek (L); rises in Nevada County, in the southwestern part of T. 17 N., R. 11 E., 5,000 feet above sea level; flows northwestward 3½ miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 2,300 feet. Colfax sheet.

Scott Creek (R); rises in Lake County, in the eastern part of T. 15 N., R. 11 W.; flows southeastward about 8 miles, northeastward 2 miles, then northwestward 3 miles and finally northeastward 2 miles into Tule Lake (outlet through Middle [Cache] Creek to Clear Lake and thus through Cache Creek to Yolo Basin). The distance from the source of this creek to the head of Tule Lake is about 4 miles; following the stream the distance is about 18 miles. Punnett's map of Lake County.

Seaman Gulch Creek (R); rises in Shasta County, in the northwestern part of T. 33 N., R. 2 W., at altitude 1,700 feet above sea level; flows southeastward about 2 miles into Little Cow Creek (tributary to Cow Creek, which flows into the Sacramento); fall, about 700 feet. Redding sheet.

Secret Canyon Creek (R); Placer County; rises in the northwestern part of T. 15 N., R. 13 E., at altitude 5,500 feet above sea level; flows southwestward 5½ miles into North Fork of Middle Fork of American River (tributary through Middle Fork of American to South Fork of American and thus through American River to the Sacramento); fall, 2,200 feet. Colfax sheet.

Secret Canyon Creek (L); Sierra County; rises in the northeastern part of T. 19 N., R. 10 E., at altitude 5,000 feet above sea level; flows east of north into North Fork of Yuba River (tributary through Middle Fork of Yuba to Yuba River and thus through Feather River to the Sacramento); length, 2 miles; fall, 2,000 feet. Downieville sheet.

Secret Ravine Creek (R); rises in Placer County, in the southeastern part of T. 12 N., R. 7 E., near Newcastle, at altitude 1,000 feet above sea level; flows southwestward 10 miles into Linda Creek (tributary to Bush Lake, American Basin); fall, about 800 feet; intermittent. Sacramento sheet.

Sereno Creek (R); rises in Placer County, in the southern part of T. 17 N., R. 14 E., in Sereno Lake, at altitude 6,902 feet above sea level; flows southward into North Fork of American River (tributary to Sacramento River); length, 3 miles; fall, 1,400 feet. Truckee sheet.

Sereno Lake; Placer County; southern part of T. 17 N., R. 14 E.; outlet, Sereno Creek to North Fork of American River (tributary through American River to the Sacramento); altitude, 6,902 feet; fall of outlet, 1,400 feet. Truckee sheet.

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Sevenmile Creek (L); rises in Tehama County, in the western part of T. 28 N., R. 1 W., on the north slope of Tuscan Buttes, at altitude 1,400 feet above sea level; flows southwestward into the Sacramento about 4 miles west of Tuscan Springs; length, about 9 miles; fall, 1,100 feet. Tehama sheet.

Sevenmile Slough; Sacramento County, between Sacramento River and San Joaquin, north of Twitchell Island. Sacramento Valley map.

Shady Creek (R); rises in Nevada County, in the northwestern part of T. 17 N., R. 9 E., at altitude 2,800 feet above sea level; flows southwestward into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); length, 8 miles; fall, 1,800 feet. Smartsville sheet.

Shady Creek, Little (R); rises in Nevada County, in the southeastern part of T. 17 N., R. 7 E., at altitude 1,800 feet above sea level; flows southward 1½ miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 1,000 feet. Smartsville sheet.

Shady Run Creek (R); rises in Placer County, in the southwestern part of T. 16 N., R. 11 E., at altitude 4,000 feet above sea level; flows southeastward 1 mile into Blue Canyon Creek (tributary through North Fork of North Fork of American River to the North Fork of American River and thus through American River to the Sacramento); fall, 2,200 feet. Colfax sheet.

Shag Slough; Yolo Basin, Solano County; a branch of Cache Slough. Sheet P, Sacramento Valley map.

Shake Ravine Creek (R); rises in Butte County, in the northern part of T. 23 N., R. 4 E., at altitude 3,400 feet above sea level; flows southward 3 miles into West Branch of Feather River (tributary through North Fork of Feather River to Feather River and the Sacramento); fall, 1,200 feet. Chico sheet.

Sheep Corral Creek (L); rises in Glenn County, in the western part of T. 21 N., R. 5 W.; flows southeastward to the South Fork of Willows Creek (which discharges through Willows Creek to the Colusa Basin); intermittent. Sheet B, Sacramento Valley map.

Sheep Hollow Creek (R); rises in Butte County, in the southern part of T. 23 N., R. 1 E., at altitude about 1,100 feet above sea level; flows southwestward 6 miles into Sycamore Creek (tributary to Mud Creek and thus through Big Chico Creek to the Sacramento); fall, 900 feet, of which 800 feet occurs in the first 2 miles of course. Chico sheet.

Shepards Slough; Glenn County, Larkin Children's ranch; extending from the Central Irrigation Canal one-half mile north of Glenn southwestward about 5 miles. Sheets B and C, Sacramento Valley map.

Sheridan Creek (L); rises in Shasta County, in the southwestern part of T. 31 N., R. 1 W.; flows northwestward into Bear Creek (tributary to Sacramento River. Redding sheet.

Shingle Creek (L); rises in Shasta County, in the eastern part of T. 31 N., R. 1 W., near Shingletown; flows northwestward into Bear Creek (tributary to Sacramento River). Redding sheet.

Shirttail Canyon Creek (L); rises in Placer County, in the north central part of T. 15 N., R. 11 E., at altitude 4,200 feet above sea level; takes an irregular but in general southwesterly course to its junction with the North Fork of American River (tributary through American River to the Sacramento); length, about 15 miles; fall, 3,200 feet. Colfax sheet.

Shotgun Creek (R); rises in Shasta County in the west-central part of T. 37 N., R. 5 W.; flows eastward to its junction with Sacramento River 1 mile southwest of Sims station, in T. 37 N., R. 4 W.; length about 5 miles; fall, 2,000 feet. Shasta sheet.

Shotgun Lake; Nevada County, east central part of T. 18 N., R. 12 E.; inlet, South Fork of Canyon Creek, which flows through it to its junction with Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to

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the Sacramento); elevation, 6,600 feet; fall of the South Fork of Canyon Creek in the mile and a quarter below Shotgun Lake, 750 feet. Colfax sheet.

Siegler Creek (R); rises in Lake County, in the southern part of T. 12 N., R. 7 W., near Siegler Springs; flows southeastward 4 miles into St. Helena Creek (tributary through Putah Creek to Yolo Basin). Punnett's map of Lake County.

Silver Creek (R); Eldorado County; formed by junction of North and Middle forks in T. 12 N., R. 14 E., in Union Valley. The North Fork rises in the southwestern part of T. 13 N., R. 16 E., on Tells Peak, at altitude 8,500 feet above sea level; flows southwestward about 11 miles to its junction with the Middle Fork. The Middle Fork rises near the center of T. 12 N., R. 16 E., about 1½ miles west of the head of Rubicon River, at altitude 8,500 feet, and takes a very circuitous but in general westerly course to its junction with the North Fork. The length of the Middle Fork above the junction is about 16 miles. Below Union Valley Silver Creek flows southwestward about 5 miles, bends sharply to the northwest, southwest, and southeast in a deep horseshoe curve, then turns again and flows southwestward 5 miles to its junction with South Fork of American River (tributary through American River to the Sacramento) which it enters through a deep cnayon. Including the major windings, the length of Silver Creek from the South Fork of American River to the head of its Middle Fork is about 30 miles. The total fall in this distance is 6,300 feet. The fall of the North Fork above the junction is nearly 4,000 feet. The principal tributaries below the Forks are South Fork of Silver and Little Silver creeks. Pyramid Peak and Placerville sheets.

Silver Creek (R); Plumas County; rises in Silver Lake, in the northeastern part of T. 24 N., R. 7 E., at altitude about 5,950 feet above sea level; flows very irregularly eastward to its junction with Spanish Creek; length, about 5 miles; total fall about 2,000 feet; several small tributaries, one of which drains Gold Lake. Bidwell Bar sheet.

Silver Creek (R); Shasta County; rises in the northeastern part of T. 33 N., R. 1 E., in Silver Lake, at altitude 3,700 feet above sea level; flows southwestward into Clover Creek (tributary to Sacramento River); length, 3 miles; fall, about 700 feet. Denny's map of Shasta County.

Silver Creek, Little (R); rises in Eldorado County, in the southern part of T. 13 N., R. 14 E., on Robbs Peak (altitude 6,725 feet); flows southwestward 5 miles into Silver Creek (tributary through South Fork of American River to American River and the Sacramento); fall, about 1,200 feet; tributary, Hunters Creek. Pyramid Peak sheet.

Silver Creek, South Fork (L); rises in Eldorado County, in the southeastern part of T. 12 N., R. 16 E., on the south slope of Pyramid Peak (altitude 10,020 feet); takes a circuitous but in general southwesterly course to its junction with Silver Creek (tributary through South Fork of American River to American River and thus to the Sacramento); length, 20 miles; fall, 5,500 feet. Pyramid Peak sheet.

Silver Fork of South Fork of American River. See *American River, South Fork, Silver Fork of.*

Silver Lake; Amador County, on boundary between Ts. 9 and 10, R. 17 E.; several small inflowing streams; outlet, Silver Fork to South Fork of American River (tributary through American River to the Sacramento); elevation, 7,150 feet; about 2 miles long and 1 mile in maximum width. Pyramid Peak sheet.

Silver Lake; Plumas County, northeastern part of T. 24 N., R. 7 E.; two inlets, one of which drains a small lake; outlet, Silver Creek to Spanish Creek (tributary to Indian Creek and thence through North Fork of Feather River to Feather River and into the Sacramento); elevation above sea level, 5,950 feet. Bidwell Bar sheet.

Silver Lake; Shasta County, northeastern part of T. 33 N., R. 1 E.; outlet, Silver Creek to Clover Creek (tributary to Sacramento River); elevation, 3,700 feet; fall of outlet, about 700 feet. Lassen Peak sheet.

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Simmerly Slough (L); Yuba County; joins Feather River at Marysville; about 4 miles long; receives Nigger Jack Slough. Marysville sheet.

Singer Creek (R); rises in Tehama County, in the southwestern part of T. 25 N., R. 2 E., at altitude 2,500 feet above sea level; flows southwestward about 14 miles into Pine Creek (tributary to the Sacramento) in the northern part of Butte County; the channels of the two creeks unite at several points; principal tributaries, Brush and Rattlesnake creeks; fall, 2,300 feet, of which 1,800 feet occurs in the first 6 miles. Chico sheet.

Slab Creek (R); rises in Eldorado County, in the southwestern part of T. 12 N., R. 13 E., on the north slope of Saddle Mountain, at altitude 5,000 feet above sea level; flows westward through Kings Meadows, then southwestward to its junction with South Fork of American River (tributary through American River to the Sacramento); length, 11 miles; fall, 3,300 feet, of which 1,300 feet occurs in the lower 5 miles; principal tributary, Gaddis Creek. Placerville sheet.

Slacks Ravine Creek (L); rises in Nevada County, in the northwestern part of T. 15 N., R. 6 E., at altitude 1,200 feet above sea level; flows westward 2 miles, then west of north 2 miles into Deer Creek (tributary through Yuba River to Feather River and thus to the Sacramento); fall, 700 feet. Smartsville sheet.

Slate Creek (L); Eldorado County; rises in the eastern part of T. 10 N., R. 10 E., near Diamond Springs, at altitude 1,700 feet above sea level; flows southwestward 2 miles, then in general northwestward 4 miles into Dry Creek (tributary through Webber Creek to South Fork of American River and thus through American River to the Sacramento); fall, 500 feet. Placerville sheet.

Slate Creek (L); Eldorado County; rises in the northwestern part of T. 11 N., R. 12 E., at altitude 3,300 feet above sea level; flows northwestward 2½ miles into Willow Creek (tributary through Rock Creek to South Fork of American River and thus through American River to the Sacramento); fall, 1,000 feet. Placerville sheet.

Slate Creek (L); Plumas County; rises near the center of T. 22 N., R. 8 E., at altitude 5,300 feet above sea level; flows northwestward into Middle Fork of Feather River (tributary through Feather River to the Sacramento); 2 miles long; fall, 2,600 feet. Bidwell Bar sheet.

Slate Creek (R); Plumas County; rises in the southwestern part of T. 24 N., R. 9 E., at altitude 4,700 feet; flows west 1 mile and north 1½ miles into Spanish Creek (tributary through Indian Creek to North Fork of Feather River, to Feather River, and into the Sacramento); length, 2 miles; total fall, 900 feet. Bidwell Bar and Downieville sheets.

Slate Creek (R); Shasta County; rises in the northeastern part of T. 37 N., R. 6 W.; flows southward to the northeastern part of T. 36 N., R. 6 W., then southeastward to its junction with Sacramento River near La Moine station, in T. 36 N., R. 5 W.; length, about 10 miles; fall (approximate), 2,700 feet. Shasta and Redding sheets.

Slate Creek (R); Plumas County, formed in the southeastern part of T. 22 N., R. 9 E., by union of Little Slate and East Branch of Slate creeks. The East Branch, here considered the continuation of the main stream, rises on the north slope of Mount Fillmore, at altitude 6,500 feet above sea level; the general course of Slate Creek is southwesterly to its junction with North Fork of Yuba River (tributary through Yuba River to Feather River and thus to the Sacramento) in the eastern part of Yuba County in T. 19 N., R. 8 E.; length, including major windings, 24 miles; total fall between head of East Branch and North Fork of Yuba River, 4,500 feet. This creek drains portions of Plumas, Sierra, and Yuba counties. Downieville and Bidwell Bar sheets.

Slate Creek (R); Tehama County; rises in T. 28 N., R. 4 E., at altitude 5,000 feet above sea level; flows southeastward into Deer Creek (tributary to Sacramento River); length, 3 miles; fall, 900 feet. Lassen Peak sheet.

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Slate Creek (L); Yuba County; rises in the eastern part of T. 19 N., R. 6 E., at altitude 2,500 feet above sea level; flows southwestward 2½ miles and unites with New York Creek to form Dry Creek (tributary to Yuba River and thus through Feather River to the Sacramento); fall, about 300 feet. Smartsville sheet.

Slate Creek, Little (L); Shasta County; rises in the eastern part of T. 35 N., R. 5 W.; at elevation 3,500 feet above sea level; flows southwest and then west into Sacramento River at La Moine station, opposite mouth of Slate Creek; length, about 3 miles; fall, 2,200 feet. Redding sheet.

Slate Creek, Little (R); Sierra County; rises in the central part of T. 22 N., R. 10 E., at altitude 6,500 feet above sea level; flows southwestward 5 miles into Slate Creek through which it is tributary to North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 1,500 feet. Downieville sheet.

Slug Canyon Creek (L); rises in Sierra County, in the northern part of T. 19 N., R. 10 E., at altitude 4,500 feet above sea level; flows northward 2 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba to Yuba River and thus through Feather River to the Sacramento); fall, 1,500 feet. Downieville sheet.

Slug Gulch Creek (R); rises in Placer County in the western part of T. 13 N., R. 10 E., at altitude 2,300 feet above sea level; flows southward 1½ miles into Middle Fork of American River (tributary through North Fork of American River and American River to the Sacramento); fall, 1,400 feet. Placerville sheet.

Sly Creek (L); rises in Plumas County, in the southern part of T. 21 N., R. 8 E., at altitude 4,500 feet above sea level; flows southwestward 5 miles, then west of north 1 mile into Lost Creek (tributary through South Fork of Feather River to Middle Fork of Feather and thus through Feather River to the Sacramento); fall, 1,200 feet. Bidwell Bar sheet.

Smith Creek (L); rises in Plumas County in Smith Lake in the southeastern part of T. 22 N., R. 12 E., at altitude 6,200 feet above sea level; flows northeastward 4 miles into Middle Fork of Feather River (tributary through Feather River to the Sacramento) near Mohawk; fall about 1,800 feet. Downieville sheet.

Smith's Creek (R); rises in Yolo County in T. 11 N., R. 1 W.; flows northeastward 4 miles; intermittent; water sinks before reaching Colusa Basin.

Smithneck Creek (L); rises in Sierra County, near the center of T. 20 N., R. 17 E., at altitude 6,300 feet above sea level; flows northwestward about 12 miles; discharges into the southeastern end of Sierra Valley on the Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall from head to Sierra Valley near Loyalton, 1,400 feet. Sierraville sheet.

Smith Lake; Plumas County, southwestern part of T. 22 N., R. 12 E., 1 small inlet; outlet, Smith Creek to Middle Fork of Feather River (tributary through Feather River to the Sacramento); elevation 6,300 feet; fall at outlet 1,800 feet in about 4 miles. Downieville sheet.

Smith Lake; Plumas County, southwestern part of T. 25 N., R. 9 E., 1 small inflowing stream; outlet Wapansel Creek, to Spanish Creek (tributary through Indian Creek to North Fork of Feather River, to Feather River, and into the Sacramento); elevation 4,100 feet. Bidwell Bar sheet.

Snaden Slough; Butte County, Bosquejo Rancho, east of Snaden Island; connected with the Sacramento 1½ miles above Wilson Landing. Vina sheet.

Snake River (L); rises near Gridley in Butte County, flows west of south into Sutter Basin, 10 miles, about 5 miles south of Marysville Buttes; intermittent. Sacramento Valley map.

Soda Creek (R); rises in Napa County, in the southeastern part of Rancho Catacoula (T. 8 N., R. 4 W.); flows southeastward 3 miles then very irregularly northwest 5 miles to its junction with Putah Creek (tributary to Yolo Basin) 2½ miles south of Monticello; tributaries, Capell Creek and Steel Canyon Creek. On Punnett's map of

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Napa County Capell Creek is indicated as the main stream. A short stretch of Soda Creek, to which Capell Creek appears to be tributary, is shown on the Napa sheet.

Soto Lake; Butte County, Bosquejo Rancho, half a mile west of Soto station; an intermittent water body, connected at flood stages by a stream flowing west of south into a slough that joins the Sacramento at Missouri Bend; elevation, about 170 feet. Vina sheet.

South Branch, South Fork. See name of main stream.

Spanish Creek (L); rises in Plumas County, in the southwestern part of T. 25 N., R. 8 E., on the south slope of Chapparal Hill at altitude 5,800 feet above sea level; takes a general southeasterly course about 5 miles then eastward 6 miles, northeastward 3 miles, then very irregularly northwest 7 miles to its junction with Indian Creek (tributary to North fork of Feather River to Feather River and thus to the Sacramento); total fall, 2,800 feet; principal tributary, Spring Garden Creek. The course of this creek is very circuitous. In a straight line the source and mouth are but 10 miles apart, but measured along the course of the stream the distance is nearly 25 miles. Bidwell Bar, Sierraville, and Indian Valley special sheets.

Spencer Lakes; Sierra County, northern part of T. 21 N., R. 11 E.; outlet, Middle Fork of North Fork of Yuba River, to North Fork of North Fork of Yuba (tributary through North Fork to Middle Fork of Yuba, and thus through Yuba River to Feather River and the Sacramento), Downieville branch; two lakes connected by a short westward-flowing stream; elevation, 6,800 feet. Downieville sheet.

Spider Lake; Eldorado County, in the southern part of T. 14 N., R. 15 E.; inlet a stream 1 mile long flowing north from a small lake just west of Buck Island Lake; elevation 6;700 feet above sea level; no outlet is shown on the map but the lake lies in an area whose natural drainage is to Rubicon River (tributary through Middle Fork of American River to American River and thus to the Sacramento). Truckee sheet.

Spring Branch [Elder Creek.] See *Willow Creek.*

Spring Creek (R); Colusa County; rises in the west-central part of T. 14 N., R. 4 W., in Spring Valley, at altitude 220 feet above sea level; flows northeastward about 6 miles into Colusa Basin, sinks before reaching Salt Creek with which its channel connects; intermittent. Sheet E, Sacramento Valley map.

Spring Creek (R); Nevada County; rises in the northwestern part of T. 17 N., R. 9 E., 1 mile west of Columbia Hill, at altitude 4,100 feet above sea level; flows southwestward 5 miles into South Fork of Yuba River (tributary through Yuba and Feather rivers to the Sacramento); fall, 2,200 feet. Colfax sheet.

Spring Creek (R); Shasta County; rises in the eastern part of T. 33 N., R. 6 W., about 3,800 feet above sea level; flows southeastward into Sacramento River at Keswick; length, 8 miles; fall, 3,200 feet. Redding sheet.

Spring Creek, South Fork (R); rises in Colusa County in the southwestern part of T. 14 N., R. 4 W.; flows northeastward about 6 miles into Spring Creek which flows into Colusa Basin. Sheet E, Sacramento Valley map.

Spring Garden Creek (R); rises in Plumas County, in the northwestern part of T. 23 N., R. 11 E., (altitude 4,500 feet above sea level); flows northwestward 10 miles to junction with Spanish Creek (tributary through Indian Creek to the North Fork of Feather River thence through Feather River to the Sacramento); fall, 1,000 feet. Downieville sheet.

Spring Valley Creek (R); rises in Butte County, 1 mile southeast of Cherokee, in T. 21 N., R. 4 E., at altitude 1,200 feet above sea level; flows northward 3 miles into West Branch of Feather River (tributary to North Fork of Feather River and thence through Feather River to the Sacramento); fall, 600 feet. Chico sheet.

Spring Valley Reservoir; Butte County, north-central part of T. 22 N., R. 4 E.; inlet, Concow Creek; outlet, Concow Creek to West Branch of Feather River (tributary through North Fork of Feather River to Feather River and the Sacramento); elevation above sea level, about 2,000 feet; fall of outlet, 800 feet. Chico sheet.

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Squaw Creek (R); Plumas County; rises near the center of T. 25 N., R. 14 E.; at altitude about 7,000 feet above sea level; flows northwest, then west to junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thence to the Sacramento); principal tributary Last Chance Creek; fall, about 3,200 feet. Honey Lake and Indian Valley special sheets.

Squaw Creek (R); Shasta County; rises in the southeast part of T. 30 N., R. 7 W., at altitude 1,200 feet above sea level; flows southeastward about 4 miles into Crow Creek (tributary through Roaring River to North Fork of Cottonwood Creek, and thus through Cottonwood Creek to the Sacramento): fall, 500 feet. Red Bluff sheet.

Squaw Creek (R); Shasta County; rises in the eastern part of T. 34 N., R. 6 W., at altitude 3,200 feet above sea level; flows southward 3 miles, then almost due east about 4 miles to its junction with Sacramento River 1 mile below Kennett; fall, approximately 2,500 feet. Red Bluff and Redding sheets.

Squaw Creek (R); Shasta County; rises in the northeastern part of T. 37 N., R. 2 W., at altitude 2,500 feet above sea level; flows, in general, south of west to junction with Pit River (tributary to Sacramento River) near Copper City; length, about 30 miles; fall, 1,800 feet; tributaries East Fork, North Fork, and Didalls Creek. Shasta and Redding sheets.

Squaw Creek (R); Siskiyou County; rises on the south slope of Mount Shasta, at altitude 8,000 feet above sea level; flows southward into McCloud River (tributary through Pit River to the Sacramento); length, about 25 miles; fall, 6,500 feet, of which 4,000 feet occurs in the first 6 miles of course. Shasta sheet.

Squaw Creek, East Fork (L); rises in Shasta County, in the northwestern part of T. 35 N., R. 1 W., at altitude 3,000 feet above sea level; flows northwesterly about 3 miles into Squaw Creek (tributary to Pit River and thus to the Sacramento); fall, 1,400 feet. Redding sheet.

Squaw Creek, North Fork (R); rises in Shasta County, in the western part of T. 36 N., R. 2 W., at altitude 3,500 feet above sea level; flows irregularly southward 8 miles to its junction with Squaw Creek (tributary to Pit River and thus to the Sacramento); fall, 2,200 feet. Redding sheet.

Squaw Creek, South Fork (R); rises in Shasta County, in the western part of T. 33 N., R. 6 W., at altitude 3,000 feet above sea level; flows northeastward about 2 miles into Squaw Creek (tributary to Sacramento River); fall, 1,500 feet. Redding sheet.

Squaw Lake; Sierra County, northwestern part of T. 21 N., R. 12 E.; outlet a stream less than one-eighth mile long, flowing northwestward into Gold Lake (outlet Frazier Creek to Middle Fork of Feather River and thence through Feather River to the Sacramento); elevation above sea, 6,600 feet; above Gold Lake, 200 feet.

Squirrel Creek (L); Nevada County; rises in the southwestern part of T. 16 N., R. 8 E., a mile west of Grass Valley, at altitude 2,500 feet above sea level; takes a general westerly course to its junction with Deer Creek (tributary through Yuba River to Feather River and thus to the Sacramento); length 10 miles; fall, 1,500 feet. The lower course of this creek lies through Penn Valley. Smartsville sheet.

Squirrel Creek (L); Plumas County; rises in the northern part of T. 22 N., R. 11 E., at altitude 5,500 feet above sea level; flows somewhat north of east into Jamison Creek (tributary to Middle Fork of Feather River and thence through Feather River into the Sacramento) which it enters in the extreme southwestern part of T. 23 N., R. 12 E.; length about 4 miles; fall, 1,000 feet. Downieville sheet.

Squirrel Creek (R); Plumas County; rises in the southwestern part of T. 25 N., R. 11 E., on the northwestern slope of Grizzly Mountains (altitude 7,700 feet above sea level); flows southward about 7 miles to its junction with Pine Creek, a tributary of Spring Garden Creek (tributary to Spanish Creek which flows through Indian Creek to the North Fork of Feather River, to Feather River, and into the Sacramento). Downieville sheet.

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St. Catherine Creek (L); rises in Sierra County, in the eastern part of T. 19 N., R. 9 E., at altitude 4,100 feet above sea level; flows northwestward 1½ miles into North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); fall, 1,500 feet. Downieville sheet.

St. Helena Creek (R); rises in Lake County, in the east central part of T. 10 N., R. 7 W.; flows southward 7 miles, then southeastward 1½ miles into Putah Creek (tributary to Yolo Basin); tributary Siegler Creek. Punnett's map of Lake County.

Stanton Creek (L); rises in Lake County, in the southwestern part of T. 16 N., R. 6 W.; flows southward into North Fork of Cache Creek (tributary through Cache Creek to Yolo Basin); length, 5 miles. Land Office map of California, 1907. On Punnett's map of Lake County the name Stanton Creek is applied to the stretch of the North Fork of Cache Creek extending southward from Stanton Creek.

Star City Creek (L); rises in Shasta County, in the northern part of T. 38 N., R. 1 W., on the north slope of Grizzly Peak, at altitude 4,000 feet above sea level; flows somewhat south of west about 5 miles to junction with McCloud River (tributary to Pit River and thus to the Sacramento); fall, 1,700 feet. Shasta sheet.

Steep Hollow Creek (R); rises in Nevada County, in the southern part of T. 17 N., R. 11 E., at altitude 5,500 feet above sea level; flows southwestward into Bear River (tributary through Feather River to the Sacramento); length about 15 miles; fall, 3,000 feet. Colfax sheet.

Steamboat Slough; Yolo Basin, west side of Grand Island at the head of the Sacramento delta; nearly 12 miles long. The west channel of the Sacramento River extends southward nearly 12 miles along the west side of Grand Island to union with the main stream.

When the Sacramento was first navigated fewer obstructions to navigation were encountered in Steamboat Slough than in old Sacramento River, as the other branch is called. For many years the slough was therefore the channel preferred by navigators, but the condition of old Sacramento River has greatly improved and it is now the main stream. Steamboat Slough receives the Yolo Basin discharge through Cache Slough. Sacramento Valley map. Report of Commission on Rivers and Harbors to the Governor of California, 1890, p. 36.

Steel Canyon Creek (R); rises in Napa County in the northern part of T. 7 N., R. 3 W.; flows northwestward 3 miles into Soda Creek (tributary through Putah Creek to Yolo Basin). Napa sheet; Punnett's map of Napa County.

Sterling Lake; Nevada County, northeastern part of T. 17 N., R. 13 E.; outlet a stream 2 miles long flowing in a circuitous but in general westerly direction to Fordyce Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); elevation, 6,700 feet; fall of outlet, 800 feet. Truckee sheet.

Stillwater Creek (L); rises in Shasta County, near the center of T. 32 N., R. 4 W., where it is formed by the junction of its East and West forks (q. v.); flows southward across Stillwater Plains into Sacramento River; length below junction of forks about 12 miles, in which distance it falls approximately 250 feet; intermittent. Redding sheet.

Stillwater Creek, East Fork (L); rises in Shasta County, near the center of T. 33 N., R. 4 W., at altitude 1,200 feet above sea level; flows southward 7 miles, and unites with West Fork to form Stillwater Creek (tributary to Sacramento River); fall, 600 feet, of which 400 feet occurs in the first 2 miles of course; principal tributary, East Valley Creek; intermittent. Redding sheet.

Stillwater Creek, West Fork (R); rises in Shasta County, in the northern part of T. 33 N., R. 4 W., on the eastern slope of Gray Rocks Mountain, at altitude 1,800 feet above sea level; flows southward about 15 miles, and unites with the East Fork to form Stillwater Creek (tributary to Sacramento River); fall, about 700 feet, of which 500 feet occurs in first mile of course; principal tributary, Moody Creek; intermittent. Redding sheet.

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Stinking Canyon Creek (R); rises in Shasta County, in the southeastern part of T. 33 N., R. 4 W., at altitude 700 feet above sea level; flows southeastward 2 miles into Dry Creek (tributary to Little Cow Creek, and thus through Cow Creek to Sacramento River); fall, 200 feet; intermittent. Redding sheet.

Stone Corral Creek (R); rises in Colusa County, in the western part of T. 17 N., R. 5 W.; flows very irregularly eastward into Colusa Basin, east of Maxwell; intermittent. Sheet D, Sacramento Valley map.

Stony Creek (L); Butte County; rises in the west-central part of T. 22 N., R. 5 E., at altitude 3,500 feet above sea level; flows southward 4 miles into North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,600 feet. Bidwell Bar sheet.

Stony Creek (R); rises in the western part of Glenn County, near the center of T. 18 N., R. 6 W., where it is formed by the union of South Fork and Little Stony Creek; drains an area comprising about 828 square miles, of which about 600 square miles is embraced in an irregular parallelogram 10 to 15 miles wide, touching the crest of the Coast Range for a distance of 50 to 60 miles. The creek flows northward along the eastern border of this area about 35 miles, then northeastward about 15 miles, and finally southeastward to its junction with the Sacramento near St. John. It is about 90 miles long and its fall is 4,000 to 5,000 feet. The basin lies south of the basin of Thomas Creek, which divides it from that of Cottonwood Creek on the north, and north of the Cache Creek basin. The tributaries from the west come from the granitic rocks of the Coast Range; the main stream flows through sedimentary rocks. At various points the streams intersect conglomerate ridges which, because of their resistance to erosion, have produced favorable sites for dams and reservoirs. Elevations in the basin range from a few hundred feet in the valleys to 6,000 feet or more at the summit of the range. Mean annual precipitation ranges from 18 inches in the valley to 40 inches or more on the mountains, where more or less of it occurs as snow. The rainfall not absorbed by the soil runs off rapidly. The low-water flow is 50 to 100 second feet, and this sinks in the gravel bed of the stream within a few miles of the point where it breaks through the buttes into Sacramento Valley. The creek rises rapidly after a few days of heavy rainfall, and for short periods may discharge 10,000 second feet of water to the Sacramento. The spring flow disappears gradually, and the creek sends little water to the Sacramento after the first of June.[1]

The principal tributaries of Stony Creek are Little Stony from the south end of the mountain area, Briscoe Creek from its middle, Grindstone Creek from its north end, and North Fork, which enters the main creek about 10 miles northwest of Orland.

The creek has been used as a source of irrigation water in the northeastern part of Glenn County. The Orland project, under construction by the Reclamation Service, will take water from Stony Creek by the aid of several dams for storage and diversion.

Gaging station near Fruto, 1901–1909.

Punnett's maps of Glenn and Colusa counties; Red Bluff and Vina sheets; Water-Supply Paper U. S. Geol. Survey No. 86.

Stony Creek, Little (R); Colusa County; rises in the northeastern part of T. 16 N., R. 8 W.; flows southeastward about 6 miles, northeastward 4 miles, eastward 2½ miles, then northward 8 miles, uniting with the South Fork to form Stony Creek (tributary to the Sacramento) in the central part of T. 18 N., R. 6 W.; principal tributaries, Cedar and Indian creeks; gaging station near Lodoga, 1907–1909. Punnett's map of Glenn and Colusa counties.

Stony Creek, North Fork (L); rises in Glenn County, in the northwestern part of T. 22 N., R. 7 W.; flows irregularly eastward, and unites with Stony Creek (tributary to Sacramento River) in Tehama County, in the southwestern part of T. 23 N., R. 5 W.; length, about 20 miles. Punnett's map of Glenn and Colusa counties.

[1] Report of examining commission [C. T. Reed, C. T. Grunsky, and J. J. Crawford] on rivers and harbors to the Governor of California, Sacramento, 1890, p. 21.

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Stony Creek, South Fork (R); rises in Colusa County, in the southeastern part of T. 17 N., R. 8 W.; takes a general northeasterly course to the center of T. 18 N., R. 6 W., where it unites with Little Stony Creek to form Stony Creek (tributary to Sacramento River). Punnett's map of Glenn and Colusa counties.

Strawberry Creek (L); rises in Eldorado County, in the eastern part of T. 10 N., R. 17 E., at altitude 9,000 feet above sea level; flows northwestward 6 miles into South Fork of American River (tributary through American River to the Sacramento) at the lower end of Strawberry Valley; fall, 3,300 feet. Pyramid Peak sheet.

Strong Ranch Slough; Sacramento County, Rancho del Paso, north of American River. Brighton sheet.

Sucker Run (R); rises in Butte County, in the northern part of T. 20 N., R. 7 E., 1 mile north of Lumpkin, at altitude 4,100 feet above sea level; flows irregularly southwestward into South Fork of Feather River (tributary to Middle Fork of Feather River, and thus through Feather River to the Sacramento); fall, 2,700 feet; length, 5 miles. Bidwell Bar sheet.

Sugarloaf Creek (R); rises in Shasta County, in western part of T. 35 N., R. 5 W., at altitude 2,000 feet above sea level; flows southeastward 4 miles into the Sacramento in the southern part of the same township; fall, about 1,000 feet; receives a number of small tributaries. Redding sheet.

Sugarloaf Creek, Little (R); rises in Shasta County, in the southern part of T. 35 N., R. 5 W., at altitude 2,000 feet above sea level; flows southeastward 2 miles and joins Sacramento River in the northern part of T. 34 N., R. 5 W.; fall, 1,100 feet. Redding sheet.

Sugarpine Gulch Creek (L); rises in Shasta County, in the southern part of T. 34 N., R. 2 W., at altitude 2,000 feet above sea level; flows south of west 2 miles into Pit River (tributary to Sacramento River); fall, about 1,200 feet. Redding sheet.

Sulphur Creek (R); rises in Colusa County in the eastern part of T. 14 N., R. 6 W.; flows southeastward 3 miles, then eastward 2 miles into Bear Creek (tributary through Cache Creek to Yolo Basin). This creek drains an area in which there are quicksilver mines and its own bed contains many mineral springs. Its water is so highly mineralized that it renders the water of the larger creek brackish and unfit for irrigation. Water-Supply Paper U. S. Geol. Survey No. 45, 1901, p. 27.

Surprise Creek (R); rises in Plumas County in the southeastern part of T. 28 N., R. 10 E., at altitude 5,500 feet above sea level; flows east of south 6 miles into Lights Creek (tributary to Indian Creek, which flows through North Fork of Feather River to Feather River and thus to the Sacramento); total fall 1,600 feet. Called Moonlight Creek on Punnett's map of Plumas County. Honey Lake sheet and Indian Valley special map.

Sutter Basin; east side of Sacramento River above mouth of Feather River, between the relatively high banks of these streams and south of Marysville Buttes. If the entire district occasionally submerged along this part of Sacramento River is considered a part of the flood basin, its length is over 30 miles and its average width 6 miles. The upper 10 miles of this area is, however, so much higher than the rest of the basin that as soon as water ceases to flow in from above it is quickly drained into the lower portion of the flat basin whence there is no escape for the water except at the height of the water in Sacramento River at its confluence with Feather River. The elevation of high water at the mouth of Feather River in ordinary floods is about 34 feet. When Sutter Basin is full of water to this height its surface has an area of 138 square miles and its contents range from 25,000,000,000 cubic feet of water to 39,000,000,000 cubic feet.

Sutter Basin is filled at very high stages of Sacramento River. It receives water from below as well as from above, and not infrequently its greatest supply enters from its lower end. Long before the river is at a height which would endanger levees below

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the mouth of Feather River its waters have been flowing through Sacramento Slough and through outlet channels of Sutter Basin northward into the basin and even across banks into it.

The general elevation of the lowest portion of this basin is 19 to 20 feet. The outlets are a number of deep sloughs which discharge into Sacramento and Feather rivers close above their confluence.

Sutter Basin receives all the water flowing southward past Sutter Buttes from Butte Basin, the floods of Butte Slough, Feather River floods, all water from breaks into the East Branch Sacramento from Buttes Slough to Knights Landing, and indirectly the water from all east side levee breaks above Butte Slough and all the water from breaks in the west side levees of Feather River.

Sacramento Valley map; report of Examining Commission on Rivers and Harbors to the Governor of California (C. T. Reed, C. E. Grunsky, J. J. Crawford, commissioners), Sacramento, 1890, pp. 63–64.

Sutters Slough; Yolo Basin; natural relief channel in the right bank of the Sacramento; continuous to Steamboat Slough. The head of this slough is open and a small amount of water flows through it. Sheet P, Sacramento Valley map.

Susanville Canyon Creek (R); rises in Shasta County, in the western part of T. 34 N., R. 2 W., on the south slope of Brock Mountain, 2,000 feet above sea level; flows southeastward 2 miles into Pit River (tributary to Sacramento River); fall, 1,100 feet. Redding sheet.

Swamp Creek (R); rises in Plumas County near the center of T. 24 N., R. 5 E., at altitude 4,600 feet above sea level; flows south 2 miles, then southeast 1½ miles into the North Fork of Feather River (tributary to Feather River and thus to the Sacramento); total fall, 3,000 feet. Bidwell Bar sheet.

Swede Creek (L); rises in Shasta County, in the northern part of T. 32 N., R. 2 W., at altitude 1,000 feet above sea level; flows southwestward 9 miles across Swede Creek plains to junction with Little Cow Creek (tributary through Cow Creek to Sacramento River); fall, about 600 feet; intermittent. Redding sheet.

Swedrengen Creek (L); rises in the eastern part of Modoc County, on the western slope of Warner Mountains, at altitude 6,000 feet above sea level; flows southwestward about 8 miles into the North Fork of Pit River (tributary through Pit River to the Sacramento); fall, about 1,300 feet. Alturas sheet.

Sweeney Creek (L); rises in Solano County, in T. 6 N., R. 1 W., 4 miles northwest of Vacaville; flows northeastward for 6 miles, then southeastward into Cache Slough; intermittent. Vacaville sheet.

Sweetwater Creek (L); rises in Eldorado County, in the central part of T. 10 N., R. 9 E., on the west slope of Pine Hill, at altitude 1,400 feet above sea level; flows northwestward into South Fork of American River (tributary through American River to the Sacramento) at Salmon Falls; length, 4 miles; fall, 800 feet. Sacramento sheet.

Sycamore Creek (L); rises in Butte County, in the southern part of T. 23 N., R. 2 E., at altitude 1,700 feet above sea level; flows southwestward about 5 miles, then westward 6 miles into Mud Creek (tributary to the Sacramento through Big Chico Creek); fall, 1,500 feet, of which 1,200 feet occurs in the first 4 miles of course. Chico sheet.

Sycamore Slough; Colusa Basin, west side of Sacramento River; the outfall channel of Colusa Basin entering the Sacramento River at Knights Landing. The upper Sycamore Slough which extends southwestward from the river at Sycamore has built up a low, flat ridge nearly across the west side trough and formed a lesser upper basin (Mormon Basin) which except in times of general inundation is connected with the lower or main basin only by a narrow throat between Sycamore Slough and the higher west side plain. Lower Sycamore Slough can discharge water into the Sacramento only when at the level of the water of the river at Knights Landing. Sheets E and F, Sacramento Valley map.

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Sykes Slough; Yolo Basin; extends southward from Putah Creek south of Davisville toward the South Fork of Putah Creek. Sacramento Valley map.

Tadpole Canyon Creek (L); rises in Placer County, in the northern part of T. 15 N., R. 13 E., at altitude 6,300 feet above sea level; flows northwestward 2½ miles into North Fork of American River (tributary through American River to the Sacramento); fall, 3,100 feet. Colfax sheet.

Tadpole Creek (L); rises in Shasta County, in the southwestern part of T. 31 N., R. 5 W., at altitude 1,500 feet; flows southeastward; water sinks before reaching Clear Creek (tributary to Sacramento River) to which the creek basin is topographically tributary; intermittent. Redding sheet.

Tartarus Lake; extreme northwestern part of Plumas County about 7 miles southeast of Lassen Peak; neither inlet nor outlet shown on map; elevation about 6,000 feet. This lake lies in Hot Spring Valley. Lassen Peak sheet.

Taylor Creek (R); rises in Plumas County, in the eastern part of T. 25 N., R. 10 E., on the western slope of the Devils Punch Bowl (altitude 5,500 feet above sea level); flows west of south 5 miles to its junction with Spring Garden Creek (tributary to Spanish Creek and thence through Indian Creek to North Fork of Feather River, to Feather River, and into the Sacramento); fall, 1,900 feet. Downieville sheet.

Taylor Lake; Plumas County, southeastern part of T. 27 N., R. 11 E., one inlet; outlet through Hungry Lake to Indian Creek (tributary through North Fork of Feather River to Feather River and thence to the Sacramento); elevation 6,850 feet above sea level. Taylor ditch takes water from this lake for Taylor diggings (altitude 5,000 feet above sea level). Indian Valley special map.

Tells Creek (R); rises in Eldorado County, in the eastern part of T. 13 N., R. 15 E., northeast of Filipinis, at altitude 7,500 feet above sea level; flows southwestward 8 miles into the North Fork of Silver Creek (tributary through Silver Creek to South Fork of American River and thus through American River to the Sacramento); fall, 2,700 feet. Pyramid Peak sheet.

Texas Creek (L); rises in Nevada County, in the central part of T. 18 N., R. 12 E., in a small lake on the south slope of Bowman Mountain at altitude 6,800 feet above sea level; flows southwestward 4 miles into Canyon Creek (tributary to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento) fall, 2,300 feet; principal tributary, stream from Lindsey Lakes. Colfax sheet.

Thomas Creek (R); rises in Tehama County, in the northern part of T. 25 N., Rs. 9 and 10 W., on the southern slope of Mount Linn and the eastern slope of Yolla Bolly Mountains, 6,000 feet above sea level; flows southeastward about 22 miles, then northeastward about 35 miles to junction with Sacramento River in Saucos Rancho, 5 miles south of Tehama; total fall, 5,800 feet; flows over sand bed and is intermittent in lower course; many small branching tributaries. Vina sheet; Punnett's map of Tehama County.

Thompson Creek (L); rises in Plumas County in the northwestern part of T. 23 N., R. 10 E., (altitude 6,500 feet); flows northeastward 4 miles, northwestward 2 miles, and then northeastward 1 mile into Spring Garden Creek (tributary to Spanish Creek, through Indian Creek to North Fork of Feather River, to Feather River, and into the Sacramento); fall, about 2,900 feet, of which 2,000 feet occurs in the first 2½ miles. The course of this creek is very circuitous, the stream traveling more than 8 miles in covering the five miles between its source and mouth. Downieville sheets.

Threemile Creek. See *Freeman Creek, Plumas County.*

Thurston Creek; rises in Lake County in T. 13 N., R. 8 W., southeast of Mount Konachti; flows southeastward 5 miles into a small lake (Thurston Lake?) 1 mile west of the lower end of Clear Lake. No outlet of this lake is shown on the map but the course of the drainage immediately south indicates that it lies in the Clear Lake drainage area. Punnett's map of Lake County.

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Timber Canyon Creek (L); rises in Shasta County, in the central part of T. 35 N., R. 2 W., on the north slope of Brock Butte, at altitude 3,000 feet above sea level; flows northwestward 2 miles into Squaw Creek (tributary to Pit River and thus to the Sacramento); fall, 1,500 feet. Redding sheet.

Todd Creek (R); rises in Placer County, in the northern part of T. 13 N., R. 10 E., near Todd Valley, at altitude 2,600 feet above sea level; flows southwestward 5 miles into Middle Fork of American River (tributary through North Fork of American River to American River and thus to the Sacramento); fall, 1,700 feet. Placerville sheet.

Toddhunters Lake; Yolo Basin, 3 miles west of Sacramento River about 7 miles northwest of Sacramento. Sheet L, Sacramento Valley map.

Toll Gate Creek (R); rises in Plumas County, in the northwestern part of T. 25 N., R. 10 E., on the southern slope of Mount Hough (altitude 7,254 feet above sea level); flows southwestward about 5 miles into Spanish Creek (tributary to Indian Creek thence through North Fork of Feather River to Feather River and into the Sacramento); fall, about 2,000 feet. Downieville sheet.

Tom Creek (L); rises in eastern Modoc County, on the western slope of Warner Mountains, at altitude 5,000 feet above sea level; flows north of west 4 miles into North Fork of Pit River, which is tributary through Pit River to the Sacramento; fall, 300 feet. Alturas sheet.

Tom Dow Creek (R); rises in Shasta County, in the northern part of T. 39 N., R. 3 W., at altitude 3,000 feet above sea level; flows southeastward about 3 miles into Squaw Creek (tributary to McCloud River and thus through Pit River to the Sacramento); fall, 1,400 feet. Shasta sheet.

Toomes Creek (L); rises in Tehama County, in the northwestern part of T. 25 N., R. 1 W., 400 feet above sea level; flows southeastward about 7 miles, and unites with Sacramento River opposite Blethen Island; fall, 220 feet; intermittent. Tehama and Vina sheets.

Town Creek (R); rises in Shasta County, in the northern part of T. 34 N., R. 3 W., on the south slope of Town Mountain, 3,000 feet above sea level; flows southeastward 3 miles into Squaw Creek (tributary to Pit River and thus to the Sacramento); fall, 2,200 feet; intermittent. Redding sheet.

Townsend Gulch Creek (L); rises in Shasta County, in the western part of T. 31 N., R. 1 W., at altitude 1,600 feet above sea level; flows northwestward 2 miles into the South Fork of Cow Creek (tributary through Cow Creek to Sacramento River) at Ellis; fall, 300 feet; intermittent. Redding sheet.

Trap Creek; rises in Nevada County, in the southwestern part of T. 17 N., R. 12 E., at altitude 5,000 feet above sea level; flows eastward 1 mile into Fall Creek (tributary through South Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); fall, 1,800 feet. Truckee sheet.

Traverse Creek (L); rises in Eldorado County, in the northeastern part of T. 12 N., R. 10 E., near Georgetown, at altitude 2,700 feet above sea level; flows east of south 6 miles into West Fork of Rock Creek (tributary through Rock Creek to South Fork of American River and thus through American River to the Sacramento); fall, 800 feet. Placerville sheet.

Trout Creek (R); rises in Siskiyou County, in T. 42 N., R. 1 E.; flows southwestward; at high stages carries water to Ash Creek (tributary to McCloud River, which flows into the Pit and is thus tributary to the Sacramento); normal flow sinks into the lava beds at the east base of Mount Shasta and reappears southward as springs which discharge to the McCloud. Modoc Lava Bed sheet.

Truckee Creek (R); rises in Tehama County, in T. 25 N., R. 3 W., at altitude 330 feet above sea level; winds very irregularly eastward about 5 miles into Saucos Rancho; sinks about 1 mile west of Tehama; fall, 100 feet; intermittent. Tehama sheet.

Tule Lake; Lake County, northern part of T. 15 N., R. 10 W.; inlet Scott Creek; outlet stream one-half mile long flowing eastward to Middle [Cache] Creek which

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flows into northern end of Clear Lake (outlet through Cache Creek to Yolo Basin). Punnett's map of Lake County 1908.

Tule Slough; Colusa Basin, west side Sacramento River extending southward from a point about a mile south of Grand Island. Sheet E, Sacramento Valley map.

Twin Lakes; Alpine County, T. 10 N., on boundary between Rs. 17 and 18 E. several small inflowing streams; outlet a stream 10 miles long flowing irregularly westward into Silver Lake (tributary through South Fork of American River and American River to the Sacramento) in Eldorado County in T. 10 N., R. 16 E., altitude 7,900 feet; fall of outlet 2,000 feet. Pyramid Peak sheet.

Twin Valley Creek (R); rises in Lake County, in the southwestern part of T. 16 N., R. 8 W.; flows northwestward 1½ miles, then eastward 2 miles into North Fork of Cache Creek (tributary through Cache Creek to Yolo Basin). This creek enters the North Fork of Cache Creek in the stretch called Bartlett Creek on Punnett's map of Lake County.

Ualtis Creek (L); rises in Solano County, in the southern part of T. 7 N., R. 2 W., on the north slope of Mount Vaca at altitude 2,000 feet above sea level. Flows eastward 3 miles through Weldon Canyon, in general southeastward, to its junction with Alamo Creek (tributary to Cache Slough) near Binghampton. Napa sheet; Punnett's map of Solano County.

Upper Salmon Lake. See *Salmon Lakes, Upper and Lower.*

Upper Sardine Lake. See *Sardine Lakes, Upper and Lower.*

Valley Creek, East (L); rises in Shasta County, in the eastern part of T. 33 N., R. 4 W., on the south slope of Bear Mountain, at altitude 1,300 feet above sea level; flows southward 2 miles, then southwestward 3 miles into East Fork of Stillwater Creek (tributary through Stillwater Creek to the Sacramento); fall, about 600 feet, of which 500 feet occurs in the first 2 miles of course; intermittent. Redding sheet.

Valley Creek, North (R); rises in Plumas County, near the center of T. 24 N., R. 5 E., at altitude 4,500 feet above sea level; flows northeastward about 5 miles into Rock Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); fall, 700 feet. Bidwell Bar sheet.

Valley Creek, West (L); rises in Lassen County, in the southwestern part of T. 37 N., R. 16 E., on the western slope of Warner Mountains, at altitude (approximate) 7,000 feet above sea level; flows in a general westerly and northwesterly course about 18 miles to its junction with the South Fork of Pit River, through which it is tributary to the Pit and thus to the Sacramento; fall, about 2,400 feet; gaging station near Likely, 1904–5. Alturas sheet; called Clark's Creek on Starkweather's map of Lassen County (1910).

Volcano Canyon Creek (R); rises in Placer County, in the central part of T. 15 N., R. 11 E., at altitude 4,500 feet above sea level; flows southwestward about 10 miles into Middle Fork of American River (tributary through North Fork of American to American River and thus to the Sacramento); fall, 3,300 feet. Colfax sheet.

Volcano Lake; Sierra County, central part of T. 20 N., R. 12 E., a half mile south of Lower Sardine Lake; outlet a stream less than a mile long flowing northeastward to the stream connecting Lower Salmon Lake with the North Fork of the North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); elevation, 6,200 feet; fall of outlet, about 700 feet. Downieville sheet.

Wades Lake; Plumas County, northeastern part of T. 21 N., R. 11 E.; no inlet; outlet, stream about three-fourths mile long flowing northeastward into Little Jamison Creek (tributary through Jamison Creek to Middle Fork of Feather River and thence through Feather River to the Sacramento) between Jamison and Grass lakes; elevation above sea, 6,450 feet; fall of outlet, about 500 feet. Downieville sheet.

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Wagon Valley Creek (L); rises in Siskiyou County, in the northeastern part of T. 40 N., R. 5 W., about 5 miles northwest of Sisson, at altitude 4,000 feet above sea level; flows southeastward 8 miles to its junction with Sacramento River in the southwestern part of T. 40 N., R. 4 W., 2 miles south of Sisson; fall, 600 feet. Shasta sheet.

Wapansel Creek (L); rises in Plumas County in the southwestern part of T. 25 N., R. 9 E., in Smith Lake, at altitude 4,100 feet above sea level; flows southward 3 miles into Spanish Creek (tributary to Indian Creek and thence through North Fork of Feather River to Feather River and into the Sacramento); fall, about 250 feet. Bidwell Bar sheet.

Ward's Creek (L); rises in Plumas County, in the southern part of T. 25 N., R. 12 E., on south slope of Mt. Ingalls (altitude 8,377 feet); flows northwestward about 10 miles to junction with Indian Creek (tributary through North Fork of Feather River to Feather River and thus to the Sacramento); in Genesee Valley, 1 mile west of Genesee; fall, about 4,700 feet. Indian Valley special sheet.

Warner Creek (L); rises on south slope of Lassen Peak in southern part of Shasta County, at altitude about 9,000 feet above sea level; takes a general southerly course to its junction with the North Fork of Feather River (tributary through Feather River to the Sacramento) in the northwestern part of Plumas County; length, about 16 miles; fall, about 4,500 feet. Lassen Peak sheet.

Washington Lake; Yolo Basin, 2½ miles west of Sacramento; a long, narrow slough-like water body mapped as permanent on the Sacramento Valley map, sheet L.

Water Canyon Creek (L); rises in Eldorado County, in the northern part of T. 11 N., R. 12 E., at altitude 4,000 feet above sea level; flows southwestward 4 miles into Slab Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 2,200 feet. Placerville sheet.

Watson Creek (L); rises in Shasta County, in the southwestern part of T. 30 N., R. 7 W., at altitude 2,600 feet above sea level; flows southeastward 2 miles into Roaring River (tributary to North Fork of Cottonwood Creek and thus through Cottonwood Creek to the Sacramento); fall, 1,400 feet. Red Bluff sheet.

Weaver Lake; Nevada County, southwestern part of T. 18 N., R. 12 E.; outlet northward to stream connecting McMurray Lake with South Fork [of Middle Fork of Yuba River] a tributary of Middle Fork of Yuba River, which flows through Feather River to the Sacramento; elevation, 5,050 feet above sea level. Colfax sheet.

Webber Creek (L); rises in Eldorado County, in the eastern part of T. 10 N., R. 11 E., where it is formed by the junction of its North and South forks. The North Fork rises in the southern part of T. 11 N., R. 10 E., at altitude 4,200 feet above sea level and flows southeastward 10 miles to its junction with the South Fork, descending in this distance 2,100 feet. The South Fork rises in the northwestern part of T. 10 N., R. 13 E., 2 miles southwest of the North Fork at altitude 3,800 feet above sea level and flows southwestward about 4½ miles, then west and northwest 4½ miles to junction with North Fork. The fall of the South Fork above the junction is about 1,800 feet. Below the junction Webber Creek takes a circuitous but in general westerly course to its junction with South Fork American River (tributary through American River to the Sacramento) in the southwestern part of T. 11 N., R. 9 E.; length of Webber Creek below the forks, 20 miles, in which distance the fall is only 1,500 feet. Principal tributaries Chunk, Ringgold, Indian, and Dry creeks. Placerville and Sacramento sheets.

Webber Creek, North and South Forks. See *Webber Creek*.

Webb Canyon Creek (R); rises in Tehama County, in the eastern part of T. 25 N., R. 2 E., on the northern slope of Keefer Ridge, at altitude 3,500 feet above sea level; flows southeastward 3 miles into Big Chico Creek (tributary to Sacramento River; fall, about 1,500 feet. Chico sheet.

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Webb Gulch Creek (L); rises in Eldorado County in the central part of T. 11 N., R. 11 E., at altitude 2,400 feet above sea level; flows westward about three-fourths mile into Rock Creek (tributary through South Fork American River to American River and thus to the Sacramento); fall, 800 feet. Placerville sheet.

West Branch, West Fork, etc. See name of Main stream.

Whaler Creek (L); rises in Eldorado County, in the northwestern part of T. 12 N., R. 12 E., on the east slope of Bald Mountain, at altitude 4,000 feet above sea level; takes a general southwesterly course into Rock Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 2,000 feet, tributary Slate Creek. Placerville sheet.

Whiskey Gulch Creek (L); rises in Shasta County in the northern part of T. 33 N., R. 6 W., at altitude 3,000 feet above sea level; flows southward 5 miles into Clear Creek (tributary to Sacramento River) at Stella; fall, 1,900 feet. Red Bluff sheet.

Whiskey Run (L); rises in Placer County, in the western part of T. 13 N., R. 7 E., at altitude 800 feet above sea level; flows northwestward 2¼ miles into Coon Creek, which flows into American Basin; fall, about 500 feet; intermittent. Sacramento sheet.

White Cabin Creek (L); rises in Glenn County, in the northwestern part of T. 21 N., R. 4 W.; flows southeastward into Sheep Corral Creek (tributary to South Fork of Willows Creek, which discharges through Willows Creek to the Colusa Basin); intermittent. Sheet B, Sacramento Valley map.

White Oak Creek (L); rises in Eldorado County, in the southern part of T. 10 N., R. 9 E., on the south slope of Pine Hill, at altitude 1,400 feet above sea level; flows northeastward 3 miles into Dry Creek (tributary through Webber Creek to South Fork of American River and thus through American River to the Sacramento); fall, 400 feet. Placerville sheet.

White Rock Canyon Creek (L); rises in Eldorado County, in the northern part of T. 10 N., R. 11 E., at altitude 2,700 feet above sea level; flows northwestward 3½ miles into South Fork of American River (tributary through American River to the Sacramento); fall, 1,500 feet. Placerville sheet.

White Rock Lake; Nevada County, central part of T. 18 N., R. 14 E., on the south slope of Mount Lola; outlet a stream 2 miles long flowing southwestward into North Creek (tributary to Fordyce Lake, which has outlet through Fordyce Creek to South Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento); elevation, 7,700 feet; fall of outlet, 900 feet. Truckee sheet.

Whitlock Ravine Creek; rises in Plumas County in the northern part of T. 24 N., R. 9 E., at altitude 4,400 feet above sea level; flows southwestward into Spanish Creek (tributary to Indian Creek and thence through North Fork of Feather River to Feather River and into the Sacramento); length, 2 miles; fall, 900 feet. Bidwell Bar and Downieville sheets.

Widow Creek (L); rises in Eldorado County, in the eastern part of T. 11 N., R. 9 E., at altitude 1,300 feet above sea level; flows north of west 2 miles into South Fork of American River (tributary through American River to the Sacramento); fall, 700 feet. Placerville sheet.

Wildcat Creek (L); rises in Tehama County, in the southern part of T. 26 N., R. 1 W., at altitude 1,000 feet above sea level; flows westward about 4 miles into Rio de los Berrendos (tributary through Antelope Creek to Sacramento River); fall, 750 feet, of which 650 feet occurs in 2 miles at head; intermittent; tributary, Little Wildcat Creek. Tehama sheet.

Wildcat Creek, Little (L); rises in Tehama County, in the western part of T. 26 N., R. 1 W., at altitude 1,050 feet above sea level; flows westward 2 miles, then northwestward one-half mile into Wildcat Creek (tributary to Rio de los Berrendos and thus through Antelope Creek to the Sacramento); fall, 750 feet, of which 700 feet occurs in 2 miles at head; intermittent; tributary, Hibbard Gulch Creek. Tehama sheet.

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Wilk Gulch Creek (L); rises in Shasta County, in the eastern part of T. 31 N., R. 2 W., at altitude 1,400 feet above sea level; flows northwestward 2 miles into South Fork of Cow Creek (tributary through Cow Creek to Sacramento River); fall, about 800 feet; intermittent. Redding sheet.

Williams Creek (L); rises in Sierra County, in the eastern part of T. 20 N., R. 12 E., at altitude 6,500 feet above sea level; flows northwestward 1½ miles into Deer Creek (tributary through North Fork of North Fork of Yuba River to North Fork of Yuba River and thus through Yuba River to Feather River and the Sacramento); fall, 1,000 feet. Downieville sheet.

Willow Creek (L); Eldorado County; rises in the centra. part of T. 10 N., R. 8 E., 1½ miles east of Mormon Island, at altitude 500 feet above sea level; flows southwestward 6 miles into American River (tributary to the Sacramento) 2 miles southwest of Folsom; fall, 400 feet. Sacramento sheet.

Willow Creek (L); Lassen County; rises in the southwestern part of T. 37 N., R. 10 E., on the northern slopes of Hayden Hill, at altitude (approximate) 5,000 feet above sea level; flows northwestward about 16 miles to its junction with Ash Creek, through which it is tributary to Pit River and thus to the Sacramento; fall, about 900 feet. Alturas sheet.

Willow Creek (R); Plumas County; rises in the western part of T. 23 N., R. 8 E., at altitude 5,500 feet above sea level; flows westward 1½ miles, then irregularly southward 4 miles to junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall, 3,100 feet. Bidwell Bar sheet.

Willow Creek (R); Plumas County; rises in the north central part of T. 23 N., R. 13 E., on the south slope of Grizzly Peak, at altitude 6,500 feet above sea level; flows southeastward about 10 miles to junction with Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall, 2,000 feet, of which 1,500 feet occurs in 1½ miles at head. Downieville sheet.

Willow Creek (R); Plumas County; rises in the southern part of T. 24 N., R. 10 E., at altitude 5,100 feet above sea level; flows southeastward 2½ miles into Middle Fork of Feather River (tributary through Feather River to the Sacramento); fall, 1,100 feet. Downieville sheet.

Willow Creek (L); Plumas County; rises — Willow Lake, on line between Rs. 5 and 6 E., T. 29 N., at altitude 5,500 feet above sea level; flows southeastward 4 miles to North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 900 feet. Lassen Peak sheet.

Willow Creek (R); Shasta County; rises in the western part of T. 32 N., R. 7 W., on the northwest slope of Bally Mountain, at altitude (approximate) 3,000 feet above sea level; flows northward 2 miles, then southeastward 2 miles into Clear Creek (tributary to Sacramento River); fall, about 1,700 feet. Red Bluff sheet.

Willow Creek (R); Shasta County; rises in the central part of T. 33 N., R. 3 W., at altitude 1,300 feet above sea level; flows southward 3 miles into Salt Creek (tributary through Little Cow Creek to Cow Creek and thus to the Sacramento); fall, 700 feet; intermittent. Redding sheet.

Willow Creek (L); Siskiyou County; rises in the southern part of T. 39 N., R. 1 W., at altitude 4,400 feet above sea level; flows westward 6 miles into McCloud River (tributary to Pit River and thus to the Sacramento); fall, 1,700 feet. Shasta sheet.

Willow Creek [Spring Branch] (L); Tehama County; rises in the northern part of T. 25 N., R. 5 W., at altitude 1,000 feet above sea level; flows eastward 11 miles into Elder Creek (tributary to Sacramento River); fall, about 800 feet; intermittent. Red Bluff sheet.

Willow Creek (L); Yuba County; rises near the center of T. 19 N., R. 8 E., at altitude 3,000 feet above sea level; takes an irregular but in general southwesterly course to its junction with the North Fork of Yuba River (tributary to Middle Fork of Yuba River and thus through Yuba and Feather rivers to the Sacramento) at Bul-

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lards Bar; length, about 10 miles; fall, 1,500 feet; tributaries, Beaver and Clear creeks. Smartsville sheet.

Willow Creek and Slough; Yolo Basin, 3 miles north of Putah Creek; extends in northeast-southeast direction nearly across the basin. Willow Creek is made up of two forks, North and South, which rise south of Cache Creek and flow southeastward, discharging into Yolo Basin through Yolo Slough. Sheet L, Sacramento Valley map.

Willow Glen Creek (R); rises in Yuba County, near the center of T. 18 N., R. 6 E., at altitude 2,500 feet above sea level; flows southward 4½ miles into Dry Creek (tributary through Yuba River to Feather River and thus to the Sacramento); fall, 1,350 feet.

Willow Lake; Plumas County, on line between Rs. 5 and 6 E., T. 29 N., one inlet; outlet Willow Creek to North Fork of Feather River (tributary through Feather River to the Sacramento). Lassen Peak sheet.

Willows Creek (R); Colusa County; an intermittent stream formed by the flood waters of its North and South forks, which unite near Willows; the stream flows southeastward into the Colusa basin. Sheet B, Sacramento Valley map.

Willows Creek, North Fork (L); rises in Colusa County, in the western part of T. 21 N., R. 3 W., at altitude 200 feet above sea level; flows somewhat east of south to the northeastern part of T. 19 N., R. 3 W., where it unites with the South Fork to form Willows Creek, which discharges into the Colusa Basin. Sheet B, Sacramento Valley map.

Willows Creek, South Fork (R); rises in Glenn County, in the southern part of T. 18 N., R. 5 W.; flows northward about 12 miles, then winds very irregularly eastward to a point near Willows, where it unites with the North Fork to form Willows Creek, which discharges into the Colusa Basin; interm ittent. Sheet B, Sacramento Valley map.

Willow Spring Creek (R); rises in Yolo County in T. 11 N., R. 1 W., at altitude 200 feet above sea level; flows northeastward 4 miles; intermittent; sinks before reaching Colusa Basin.

Wilson Creek (R); rises in Colusa County, in the central part of T. 21 N., R. 4 W., at altitude 280 feet above sea level; flows southeastward about 8 miles; intermittent; at flood stages may unite with the South Fork of Willows Creek (tributary to the Colusa Basin). Sheet B, Sacramento Valley map.

Winchester Lake; Yolo Basin, Yolo County, 2 miles north of Big Lake on the edge of the tidal marsh. Sheet M, Sacramento Valley map.

Wittawakit Creek (R); rises in Shasta County, in the western part of T. 36 N., R. 3 W., on the south slope of Nawtawakit Mountain, 3,300 feet above sea level; flows southward 2 miles into McCloud River (tributary through Pit River to the Sacramento); fall, 2,200 feet; intermittent. Redding sheet.

Wolf Creek (L); Eldorado County; rises in the western part of T. 10 N.. R. 15 E., at altitude 6,000 feet above sea level; flows northwestward 5 miles into South Fork of American River (tributary through American River to the Sacramento); Pyramid Peak sheet.

Wolf Creek (R); Lake County; rises in the southeastern part of T. 15 N., R. 7 W., and flows southeastward about 6 miles into North Fork of Cache Creek (tributary through Cache Creek to Yolo Basin). Punnett's map of Lake County.

Wolf Creek (R); Nevada County; rises in the southern part of T. 16 N., R. 8 E., at altitude 2,200 feet above sea level, 1 mile south of Grass Valley; takes an irregular but in general southwesterly course to its junction with Bear River (tributary through Feather River to the Sacramento); length, about 14 miles; fall, 100 feet; tributaries, Rattlesnake and South Wolf creek. Smartsville sheet.

Wolf Creek (R); Sierra County; rises in the central part of T. 19 N., R. 10 E., at altitude 5,500 feet above sea level; flows southeastward into Middle Fork of Yuba River (tributary through Feather River to the Sacramento); length, 4 miles; fall, 2,400 feet. Colfax sheet.

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Wolf Creek, Little (R); rises in Nevada County, in the eastern part of T. 14 N., R. 7 E., at altitude 1,500 feet above sea level; flows irregularly southeastward into Bear River (tributary through Feather River to the Sacramento); length, about 7 miles; fall, 1,000 feet. Smartsville sheet.

Wolf Creek, South (L); rises in Nevada County, in the northwestern part of T. 15 N., R. 9 E., at altitude 2,700 feet above sea level; flows southwestward 10 miles into Wolf Creek (tributary through Bear River to Feather River and thus to the Sacramento); fall, 1,500 feet. Smartsville sheet.

Wolf's Creek (R); rises in Plumas County, in the northern part of T. 27 N., R. 8 E., on south slope of Mount Diamond (altitude 5,000 feet above sea level); flows southeastward 8 miles to Greenville, then eastward 4 miles, discharging into the swampy area just north of Indian Creek (tributary to North Fork of Feather River and thence through Feather River to the Sacramento); total fall, 1,500 feet; principal tributary, North Canyon Creek, which flows from Round Valley reservoir. Honey Lake sheet and Indian Valley special map.

Woodman Creek (R); rises in Shasta County, in the central part of T. 33 N., R. 2 W., at altitude 1,500 feet above sea level; flows southwestward about 6 miles into Little Cow Creek (tributary through Cow Creek to the Sacramento); fall, about 900 feet; intermittent. Redding sheet.

Woodruff Creek (L); rises in Sierra County, in the western part of T. 19 N., R. 10 E., at altitude 4,500 feet above sea level; flows northward into Rock Creek (tributary to North Fork of Yuba River, which flows through Middle Fork of Yuba and Yuba rivers to Feather River and thus to the Sacramento) at Goodyears Bar; length, 4 miles; fall, 1,900 feet. Downieville sheet.

Woodville Creek (R); rises in Yuba County, in the central part of T. 19 N., R. 7 E., at altitude 3,600 feet above sea level; flows southeastward about 5 miles into North Fork of Yuba River (tributary through Middle Fork of Yuba River to Yuba, Feather, and Sacramento rivers); fall, 1,500 feet. Smartsville sheet.

Wrights Lakes; Eldorado County, in the southwestern part of T. 12 N., R. 16 E., just north of Blakeley; inlet, a stream from the east flowing from the northern slopes of Pyramid Peak; outlet a stream 2½ miles long flowing south then southwest into South Fork of Silver Creek (tributary through Silver Creek to South Fork of American River and thus through American River to the Sacramento); altitude, 6,950 feet; fall of outlet, about 400 feet; 2 small connected lakes. Pyramid Peak sheet.

Wyandotte Creek (R); rises in Butte County, in the northeastern part of T. 18 N., R. 4 E., one-half mile west of Wyandotte, at altitude 600 feet above sea level; flows southwestward to Central House, then somewhat east of south to its junction with North Honcut Creek (tributary through Honcut Creek to Feather River and thus to the Sacramento); length, 14 miles; the fall, somewhat more than 500 feet, occurs almost entirely in the 4 miles at the head of the stream, the fall in the lower 10 miles being exceedingly small. Smartsville and Marysville sheets.

Yankee John Ravine Creek (R); rises in Eldorado county, in the western part of T. 11 N., R. 12 E., at altitude 3,000 feet above sea level; flows southwestward 1 mile into Slab Creek (tributary through South Fork of American River to American River and thus to the Sacramento); fall, 1,000 feet. Placerville sheet.

Yellow Creek (R); rises in Plumas County in the extreme northwestern part of T. 26 N., R. 6 E. at altitude 6,000 feet above sea level; flows eastward about 8 miles then southward 12 miles into the North Fork of Feather River (tributary through Feather River to the Sacramento); fall, 4,000 feet. Lassen Peak sheet.

Yolo Basin; west side Sacramento River from Grafton on the north to Cache Slough on the south; length 40 miles; average width 7 miles; capacity in times of general flood, when its water surface slopes from north to south at the rate of 4 to 6 inches per mile, about 50,000,000,000 cubic feet, an amount which might be exceeded if inflow of water from above was sufficiently rapid.

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Yolo Basin has outlet into Sacramento River at the lower end of Grand Island and becomes a steady flowing sea in times of general floods. Cache and Putah sloughs and minor streams from the Coast Range south of Cache Creek discharge into this basin. About 90 square miles of the bottom of Yolo Basin is less than 10 feet higher than the low water of Suisun Bay, and the lowest portion of it is always covered with water (Big Lake).

Yolo Basin, like some of the others, begins to receive water from the river long before the river is bank full. The tides ebb and flow through Cache Slough, the rise and fall ranging from nearly 6 feet at low water to about 1 foot at extreme flood stages. At every rise of the river the quantity of water in the basin is increased, and when the river reaches its ordinary flood stage, even before it overtops its banks, Yolo Basin is full to the level of river water at the foot of Grand Island.

Sheets I to P, Sacramento Valley map. Report of the Examining Commission on Rivers and Harbors to the Governor of California (C. T. Reed, C. E. Grunsky, J. J. Crawford, commissioners), Sacramento, 1890, p. 67.

Young America Lake; Sierra County, central part of T. 20 N., R. 12 E.; outlet Sardine Creek, which flows through Upper and Lower Sardine Lakes to the stream connecting Lower Salmon Lake with North Fork of North Fork of Yuba River (tributary through North Fork of Yuba River to Yuba River and thus through Feather River to the Sacramento); elevation above sea level 6,700 feet; above Upper Sardine Lake 600 feet; above Lower Sardine Lake 800 feet. Downieville sheet.

Yuba River (L); rises near the crest of the Sierra Nevada in the central part of Nevada County; flows southwestward to its junction with Feather River at Marysville; extreme length of the basin from the mouth of the river to the crest of the Sierras about 70 miles; greatest width, 35 miles; drainage area, more than 1,300 square miles. The river is formed by 3 principal forks; Middle, North and South. The Middle Fork, which drains a larger area and may therefore be considered the continuation of the main stream, rises in Sierra and Nevada counties on the west and south slopes of Webber Peak, in Ts. 18 and 19 N., Rs. 13 and 14 E., and takes a general southwesterly course. The Middle Fork forms a boundary between Sierra and Nevada counties. It receives the North Fork in Yuba County in the northeastern part of T. 17 N., R. 7 E., and the South Fork in Nevada County in the southwestern part of T. 17 N., R. 7 E.

The topography of the Yuba basin is rugged and mountainous. From the edge of the Sacramento Valley the surface rises gently through the foothills and then more abruptly through rounded and broken mountains to the crest of the Sierras which along the Yuba-Truckee divide has a mean elevation of about 8,000 feet and a few peaks exceeding 9,000 feet. The streams have cut deep canyons which head well up in the mountains. All the principal part of the basin, comprising more than 800 square miles, is now included in a national forest.

The mean annual precipitation ranges from 18 inches at the mouth of the river at Marysville to about 70 inches near the crest of the mountains. In the upper and central parts of the basin the precipitation ranges from 50 to 70 inches and occurs principally as snow which remains on the ground all winter and well into the summer. Perennial springs are found in different parts of the basin, principally along the North Fork.

Yuba River in 1849 and before that time was a clear-water stream and occupied a bed deep below the surface of the flanking bottom lands. Up to 1862 the Yuba was navigable all the year for ships and boats drawing 9 or 10 feet of water. As the result of hydraulic mining the bed of the Yuba River was gradually built up by successive deposits of débris, and in 1868 the people of Marysville found it necessary to build levees to protect the city from overflow. The river bed continued to rise after the building of the levees, and during the flood of 1875 the levees broke and for the first time in its history Marysville was inundated. The bed of the river has been raised from about 11 feet at its mouth to about 80 feet at Smartsville, 20 miles upstream.

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For 10 miles above the mouth the levees are 1 to 2½ miles apart, the space between being covered with débris; the material in each ranges from cobblestones at Smartsville to a mixture of sand and clay with some gravels in the main channels at the junction with Feather River. An attempt has been made to restrain this débris from moving downstream by building barrier dams, but it has not been successful.

Surveys and data: Truckee, Downieville, Colfax, Smartsville, Bidwell Bar and Marysville sheets; reports of California Débris Commission; reports on the control of floods in the river systems of the Sacramento Valley and the adjacent San Joaquin Valley, California (House Doc. 81, Sixty-second Cong., first sess).

Yuba River, Middle Fork, South Fork of (L); rises in Nevada County in the southeastern part of T. 19 N., R. 12 E., on the west slope of Findley Peak, at altitude 7,000 feet above sea level; flows westward into Middle Fork of Yuba River (tributary through Yuba River to the Feather and thus to the Sacramento); length 6 miles; fall 3,000 feet.

Yuba River, North Fork (R); formed in Sierra County by the union of North and South forks. The North Fork, here considered the master stream, rises 2 miles northeast of Summit House at altitude 7,300 feet above sea level; takes a circuitous but in general southwesterly course to its junction with the South Fork, 1 mile east of Sierra City in the southern part of T. 20 N., R. 12 E. From this junction the North Fork of the Yuba flows almost directly west to Downieville whence its course is in general southwestward to its junction with the Middle Fork of the Yuba, 2 miles west of North San Juan. From the head of the North Fork of the North Fork to the junction with the Middle Fork the distance is about 50 miles and the fall is 6,000 feet. Downieville, Bidwell Bar, and Smartsville sheets.

Yuba River, North Fork, East Fork of (L); rises in Sierra County, in the eastern part of T. 21 N., R. 11 E., in Lake Hawley, at altitude 6,700 feet above sea level; flows southwestward into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba to Middle Fork of Yuba, and thus through Yuba River to Feather River and the Sacramento), Downieville branch; length, 12 miles; fall, 3,700 feet; tributaries, Butcher Ranch and Hog Canyon creeks. Downieville sheet.

Yuba River, North Fork, Middle Fork of (L); rises in Sierra County, in the northern part of T. 21 N., R. 11 E., in Spencer Lakes, at altitude 6,800 feet above sea level; flows southwestward into North Fork of North Fork of Yuba River (tributary through North Fork of Yuba to Middle Fork of Yuba and thus through Yuba River to Feather River and the Sacramento), Downieville branch; length, 14 miles; fall, 3,800 feet. Downieville sheet.

Yuba River, North Fork, North Fork of (R); rises in Sierra County, in T. 21 N., R. 10 E., near Deadwood, at altitude 6,100 feet above sea level; flows southward into North Fork of Yuba River (tributary to Middle Fork of Yuba and thus through Yuba River to Feather River and the Sacramento) at Downieville. Another stream called "North Fork of North Fork of Yuba River" unites with South Fork of North Fork of Yuba near Sierra City to form the North Fork of Yuba River. The North Fork of the North Fork of Yuba River which enters at Downieville has two large tributaries, called the Middle Fork of the North Fork and the East Fork of the North Fork. The nomenclature of these forks of the Yuba is very complex and confusing and is incomprehensible without constant reference to the map. The Downieville North Fork of North Fork of Yuba is about 7 miles long and falls 3,600 feet; gaging station at Downieville, 1910–11. Downieville sheet.

Yuba River, North Fork, South Fork of (L); rises in Sierra County, in the northwestern part of T. 19 N., R. 14 E., at altitude 7,700 feet above sea level; flows northwestward to junction with North Fork of Yuba River (tributary through Middle Fork of Yuba to Yuba River, and thus through Feather River to the Sacramento) just east of Sierra City; length, 12 miles; fall, 3,300 feet. Sierraville and Downieville sheets.

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Yuba River, South Fork (L); rises in Nevada and Placer counties on the west slope of the Sierra Nevada, the headwaters consisting of many small branching streams flowing from the west slopes of Mount Lincoln, Donner Peak, and Castle Peak. The elevation of this portion of the crest of the Sierra exceeds 8,000 feet above sea level, Castle Peak rising to an altitude of 9,139 feet, Donner Peak to 8,315 feet, and Mount Lincoln to 8,403 feet. From Donner Pass the course of the South Fork of the Yuba is in general westerly to its junction with the Middle Fork of Yuba River (tributary through Feather River to the Sacramento), 2 miles west of Bridgeport in Nevada County. The length of the stream, including the major windings, is about 60 miles. The total fall from the crest of the Sierra to Yuba River is about 7,500 feet; total fall from Donner Pass to Yuba River is 6,500 feet. The basin is comparatively narrow, the tributary streams are short and most of them enter the Yuba through deep canyons. The upper part of the basin contains numerous lakes. Truckee, Colfax, and Smartsville sheets.

Zamora Creek (R); rises in Yolo County in T. 11 N., R. 1 W., south of Britona Creek; flows northeastward about 2½ miles; intermittent; sinks before reaching Colusa Basin. Dunnigan sheet.

Zummershed Creek (R); rises in Tehama County, in T. 24 N., R. 1 E., at altitude 3,000 feet above sea level; flows southwestward about 11 miles into Pine Creek (tributary to Sacramento River); fall, 2,700 feet. Chico sheet.

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GAGING STATIONS MAINTAINED IN THE SACRAMENTO RIVER BASIN FROM 1888 TO JULY 1, 1912.

The following list comprises the gaging stations that have been maintained in the Sacramento River basin. Stream-flow data for these stations are published in Water-Supply Paper 298. (See p. 3.) The stations are arranged in downstream order, tributaries being indicated by indention. A dash following the date implies that the station was being maintained July 1, 1912:

Sacramento River at Castella, 1910–
Sacramento River at Antler, 1910–
Sacramento River at Jellys Ferry, 1895–1902.
Sacramento River near Red Bluff, 1902–
Sacramento River at Red Bluff, 1894–1896.
Sacramento River at Collinsville, 1878–1885.
Sacramento River at Sacramento, 1904–5.
    Pit River near Canby, 1904–5.
    Pit River near Bieber, 1904–1908.
    Pit River at Henderson, 1910–
    Pit River near Ydalpom, 1910–
        Cottonwood Creek near Lakeview, Oreg., 1908–
        Drews Creek near Lakeview, Oreg., 1909–
        South Fork of Pit River near Ivy, 1904–5.
            West Valley Creek near Likely, 1904–5.
        Ash Creek at Adin, 1904–5.
        Fall River at Fall River Mills, 1912–
        Hat Creek at Hawkin's Ranch, 1911–
        Hat Creek at Hat Creek, 1910–
            Rising River[1] near Cassel, 1911–
        Burney Creek near Burney, 1911–
        Kosk Creek near Henderson, 1910–
        Montgomery Creek at Montgomery Creek, 1911–
        Squaw Creek near Ydalpom, 1910–
        McCloud River near Gregory, 1902–1908.
        McCloud River at Baird, 1910–
    Clear Creek near Shasta, 1911–
    Cow Creek at Millville, 1911–
        Clover Creek at Millville, 1911–
        Little Cow Creek near Palo Cedro, 1911–
    Bear Creek near Millville, 1911–
    North Fork of Cottonwood Creek at Ono, 1907–
    Mill Creek near Los Molinos, 1909–
    Deer Creek near Vina, 1911–
    Stony Creek near Fruto, 1901–
        Little Stony Creek near Ladoga, 1907–

[1] Rising River is a small spring-fed stream (unnamed on the maps and therefore not described in the gazetteer) that enters Hat Creek from the east just south of Cassel.

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Sacramento River—Continued.
- North Fork of Feather River [head of Feather River] above Prattville, 1905–1907.
- North Fork of Feather River below Prattville, 1905–
- North Fork of Feather River near Big Bend, 1905–
- Feather River at Oroville, 1902–
  - Hamilton Branch near Prattville, 1905–1907.
  - Butt Creek at Butte Valley, 1905–
  - Indian Creek near Crescent Mills, 1905–1909, 1911–
    - Spanish Creek near Keddie, 1911–
  - Middle Fork of Feather River at Cromberg, 1910–
  - Middle Fork of Feather River near Oroville, 1911–
    - Grizzly Creek near Beckwith, 1905–6.
  - South Fork of Feather River at Enterprise, 1911–
  - Palermo Land & Water Co.'s canal, 1911–
  - Middle Fork of Yuba River [head of Yuba River] at Freeman's bridge, near North San Juan, 1900–
  - Middle Fork of Yuba River near North San Juan, 1910–
  - Yuba River near Smartsville, 1903–
  - Yuba River at Parks Bar bridge near Smartsville, 1900–
    - Oregon Creek (tributary to Middle Fork of Yuba) near North San Juan, 1910–
    - North Fork of Yuba River near Sierra City, 1911–
    - North Fork of Yuba River at Goodyear Bar, 1910–
    - North Fork of Yuba River near North San Juan, 1900–
      - North Fork of North Fork of Yuba River at Downieville, 1910–
      - Rock Creek at Goodyear Bar, 1910–
      - Goodyear Creek at Goodyear Bar, 1910–
  - Bear River near Colfax, 1911–
  - Bear River at Van Trent, 1904–
- North Fork of American River [head of American River] near Colfax, 1911–
- American River at Fairoaks, 1904–
  - Middle Fork of American River near East Auburn, 1911–
    - Rubicon River at Rubicon Springs, 1910–11.
    - Rubicon River near Quintette, 1909–1911.
      - Little Rubicon River near Rubicon Springs, 1910–11.
      - Little South Fork of Rubicon River at sawmill near Quintette, 1910–11.
      - Little South Fork of Rubicon River below Gerlé Creek, near Quintette, 1910–11.
      - Little South Fork of Rubicon River at mouth, near Quintette, 1909–1911.
        - Little South Fork ditch at sawmill near Quintette, 1910–11.
        - Gerlé Creek near Rubicon Springs, 1910–11.
      - Pilot Creek near Quintette, 1910–11.
      - Pilot Creek ditch near Quintette, 1910–11.
  - South Fork of American River at Kyburz, 1906–7.
  - South Fork of American River near Kyburz, 1906.
  - South Fork of American River below Kyburz, 1907.
  - South Fork of American River near Placerville, 1911–
- Clear Lake in Lake County, 1874–1900.
- Cache Creek at Lower Lake, 1901–
- Cache Creek at Yolo, 1903–
- Putah Creek near Guenoc, 1904–1906.
- Putah Creek at Winters, 1905–

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 296

GAZETTEER OF SURFACE WATERS OF CALIFORNIA

PART II. SAN JOAQUIN RIVER BASIN

PREPARED UNDER THE DIRECTION OF JOHN C. HOYT

BY

B. D. WOOD

In cooperation with the State Water Commission and the Conservation Commission of the State of California

WASHINGTON
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1912

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NOTE.

A complete list of the gaging stations maintained in the San Joaquin River basin from 1888 to July 1, 1912, is presented on pages 100–102.

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GAZETTEER OF SURFACE WATERS IN SAN JOAQUIN RIVER BASIN, CALIFORNIA.

By B. D. Wood.

INTRODUCTION.

This gazetteer is the second of a series of reports on the surface waters of California prepared by the United States Geological Survey under cooperative agreement with the State of California as represented by the State Conservation Commission, George C. Pardee, chairman; Francis Cuttle; and J. P. Baumgartner, and by the State Water Commission, Hiram W. Johnson, governor; Charles D. Marx, chairman; S. C. Graham; Harold T. Powers; and W. F. McClure. Louis R. Glavis is secretary of both commissions. The reports are to be published as Water-Supply Papers 295 to 300 and will bear the following titles:

295. Gazetteer of surface waters of California, Part I, Sacramento River basin.
296. Gazetteer of surface waters of California, Part II, San Joaquin River basin.
297. Gazetteer of surface waters of California, Part III, Great Basin and Pacific coast streams.
298. Water resources of California, Part I, Stream measurements in the Sacramento River basin.
299. Water resources of California, Part II, Stream measurements in the San Joaquin River basin.
300. Water resources of California, Part III, Stream measurements in the Great Basin and Pacific coast river basins.

The gazetteers embrace descriptions of all the streams named on the best available maps. For the San Joaquin basin these maps are chiefly those published by the United States Geological Survey as sheets of the Topographic Atlas of the United States. For districts not yet mapped by the Survey, Land Office maps, a manuscript map of the San Joaquin Valley by A. J. Fisk, jr., and H. R. Johnson, J. L. LeConte's map (manuscript) of a portion of the Sierra Nevada in central California, a map of the Sierra Nevada in central California issued as publication No. 12 of the Sierra Club, and Punnett's county maps have been used.

Each stream is described as rising near the point at which its beginning is shown on the map, and the elevation of that point is given as the elevation of the source. It is of course recognized that

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this method does not give results of great precision, but it probably causes no greater errors in the determination of length and fall than would be caused by extending each stream to the head of the divide between its basin and that of the adjoining streams. It should be understood, however, that all statements of elevation, length, and fall are merely approximate.

The Survey maps used in the preparation of the gazetteer of streams in the San Joaquin basin are listed below in alphabetic order. An index map showing the area covered by each sheet may be obtained by applying to the Director, United States Geological Survey, Washington, D. C.

Topographic sheets covering areas in San Joaquin River basin.[1]

Bakersfield.
Big Trees.
Dardanelles.
Kaiser.
Kaweah.
Kernville.
Mariposa.
Mount Goddard.
Mount Lyell.
Mount Whitney.
Olancha.
Orestimba-Panoche-Cantua special.[2]
Sonora.
Tehipite.
Tejon.
Yosemite.
Yosemite National Park.
Yosemite Valley.

GAZETTEER.

The letter L or R in parentheses after the name of a stream indicates that the stream is a tributary from the left or right, respectively, to the stream into which it flows. The word "sheet" refers to Geological Survey atlas sheets.

Ackerson Creek (R); Tuolumne County; Stanislaus National Forest; rises in the western part of T. 1 S., R. 20 E., Mount Diablo base and meridian, on the southern and eastern slopes of Bald Mountain at altitude 7,000 feet; flows, in general, south of west 6 miles to its junction with South Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 2,900 feet, of which 1,500 feet occurs in the first 2 miles; middle course of creek lies through Ackerson Meadow. Yosemite National Park map.

Agua Fria Creek (R); Mariposa County; rises in northern part of T. 6 S., R. 18 E., Mount Diablo base and meridian; flows southeastward into Mariposa Creek; much shorter than Buckeye Creek, which is mapped as tributary to it. Mariposa sheet; Land Office map of California, 1907.

Alder Creek (R); Madera County; rises in the northwestern part of T. 6 S., R. 22 E., Mount Diablo base and meridian, in the Fresno grove of big trees, at altitude 5,600 feet above sea level; flows southward 2 miles into Nelder Creek (tributary through Lewis Fork of Fresno River to Fresno River and thus to San Joaquin River); fall, 1,000 feet. Mariposa sheet.

Alder Creek (R); Mariposa County; Yosemite National Park; rises in the southeastern part of T. 3 S., R. 21 E., Mount Diablo base and meridian, at altitude 7,600 feet above sea level; flows southwestward 7 miles into South Fork of Merced River; fall, 4,000 feet. Yosemite National Park map.

[1] An act of Congress approved Feb. 18, 1897, prescribes that the maps shall be disposed of by sale. They are sold at the rate of 5 cents a sheet of standard size. If 100 or more standard topographic atlas sheets or their equivalent in value in other maps are ordered, a discount of 40 per cent will be made from the retail price—that is, 100 standard topographic atlas sheets will cost $3.

[2] Advance copy of a map prepared for publication, probably with a different title, in a Survey report on the west border of the San Joaquin Valley.

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Alkali Creek (R); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, at altitude 9,350 feet above sea level; flows southwestward 5 miles into Conness Creek (tributary through Tuolumne River to San Joaquin River); fall, 1,300 feet; intermittent. Yosemite National Park map.

Alpine Creek (R); Fresno County; Sierra National Forest; rises in the northern part of T. 11 S., R. 30 E., Mount Diablo base and meridian, at altitude 11,000 feet above sea level; flows southward 5 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,500 feet, of which 2,000 feet is made in the last mile. Tehipite sheet.

Alpine Creek (R); Tulare County; Sequoia National Forest; rises in the east central part of T. 19 S., R. 31 E., Mount Diablo base and meridian, at altitude 8,200 feet above sea level; flows eastward 2½ miles, then southeastward 2½ miles into Little Kern River tributary to Kern River); fall, 2,200 feet; tributaries, Pecks Canyon and Mountaineer creeks. Kaweah sheet.

Amador Creek (L); Amador County; rises in the southern part of T. 7 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,000 feet above sea level; flows irregularly westward 8 miles into Rancheria Creek (tributary to Dry Creek and thus through Mokelumne River to the San Joaquin); fall, 1,400 feet. Jackson sheet.

Amphitheater Lake; Fresno County; Sierra National Forest; 1 mile north of Dumbbell Lakes; two small inflowing streams; outlet, Cataract Creek to Palisade Creek; altitude, 10,700 feet; fall of outlet, 1,900 feet. Mount Goddard sheet.

Amphitheater Lake; Tulare County; Sequoia National Forest; western part of T. 17 S., R. 32 E., Mount Diablo base and meridian, in a glacial cirque on the eastern slope of the Great Western Divide; no outlet, but the basin is topographically tributary to Soda Creek, which flows through Big Arroyo to Kern River. Kaweah sheet.

Angels Creek (R); Calaveras County; rises in the southeastern part of T. 3 N., R. 14 E., Mount Diablo base and meridian, at altitude 3,100 feet above sea level; flows southwestward 12 miles, then southward 6 miles to its junction with Stanislaus River (tributary to the San Joaquin); fall, about 2,500 feet; principal tributary, Sixmile Creek. Jackson and Big Trees sheets. Land Office map of California, 1907.

Antelope Creek (R); Amador County; rises in the southwestern part of T. 8 N., R. 14 E., Mount Diablo base and meridian, near Antelope Springs, at altitude 4,500 feet above sea level; flows southwestward 4½ miles, then southeastward 1 mile into Mill Creek; fall, 1,600 feet. Pyramid Peak, Big Trees, and Jackson sheets.

Arndt Lake; Tuolumne County; Yosemite National Park; southeastern part of T. 3 N., R. 22 E., Mount Diablo base and meridian; outlet, a stream half a mile long, flowing northward to Rancheria Creek (tributary through Tuolumne River to the San Joaquin) near upper end of Kerrick Canyon; altitude, 9,250 feet; fall of outlet, 100 feet. Yosemite National Park map.

Arnot Creek (R); Alpine County; Stanislaus National Forest; rises just south of the south line of T. 8 N., R. 20 E., 1½ miles south of east of Highland Lake, at altitude 8,600 feet above sea level; flows southwestward 6 miles, then southeastward 2 miles into Clark Fork (tributary through Middle Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); fall, 2,400 feet. Dardanelles sheet.

Arrow Creek (L); Fresno County; rises in Sierra National Forest, on the south slope of Arrow Peak (altitude 12,927 feet); flows southwestward 5 miles into South Fork of Kings River (tributary to San Joaquin River); passes through several lakes; fall, 4,300 feet, of which 1,300 feet occurs in half a mile at the mouth. Mount Whitney and Tehipite sheets.

Ashland Creek (L); rises in the southern part of T. 8 N., R. 13 E., at altitude 4,000 feet above sea level; flows southwestward 6 miles into Sutter Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin); fall, 1,800 feet. Jackson sheet.

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Avalanche Creek (L); Fresno County; Sierra National Forest; rises in the southeastern part of T. 13 S., R. 31 E., Mount Diablo base and meridian, on the north slope of Avalanche Peak (altitude 11,264 feet); flows northward 2½ miles into South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,000 feet. Tehipite sheet.

Avalanche Creek (L); Mariposa County; Yosemite National Park; rises in the western part of T. 3 S., R. 21 E., at altitude 7,000 feet above sea level; flows north of west 3 miles into Merced River (tributary to San Joaquin River); fall, 4,000 feet. Yosemite National Park map.

Avenal Creek (L); Fresno and Kings counties; rises in the northeastern part of T. 23 S., R. 15 E., flows southeastward 22 miles, then, in general, northeastward 10 miles into San Joaquin Valley south of Tulare Lake; sinks below the foothills; carries water only during the rainy season. Manuscript map of San Joaquin Valley (compiled by Fisk and Johnson); Land Office map of California, 1907.

Babcock Lake; Mariposa County; western part of T. 2 S., R. 24 E., Mount Diablo base and meridian; inlet, Fletcher Creek; outlet, Fletcher Creek to McClure Fork (tributary through Merced River to the San Joaquin); altitude, 8,850 feet; fall of Fletcher Creek in the mile between Babcock Lake and McClure Fork, 950 feet, Mount Lyell sheet.

Backbone Creek (L); Fresno County; rises in; on the east slope of Backbone Mountain, at altitude 2,500 feet above sea level; flows northwestward 2 miles into San Joaquin River; fall, 1,300 feet; intermittent. Kaiser sheet.

Badger Lake; Madera County; northern part of the Sierra National Forest; one-half mile east of the northern end of Thousand Island Lake; one inlet; outlet, a stream one-half mile long, flowing northeastward into Middle Fork of San Joaquin River; elevation, 9,800 feet; very small.

Bald Mill Creek (L); Fresno County; rises in the northeastern part of T. 10 S., R. 23 E., on the north slope of Bald Mountain, at altitude 4,500 feet above sea level; flows northwestward 3½ miles into San Joaquin River in the Horseshoe Bend; fall, 3,300 feet. The upper part of this basin is an open meadow and contains several settlements. Kaiser sheet.

Basin Creek (R); rises in the western part of T. 29 S., R. 32 E., Mount Diablo base and meridian; flows southwestward into Caliente Creek near Pampa. Its basin joins the basin of the Kern on the northern border. A peculiar feature of this basin is a mountain valley known as Walkers Basin (altitude, 3,200 feet above sea level). Gaging station near Havalah (1911–12). Manuscript map of San Joaquin Valley (compiled by A. J. Fisk, jr., and H. R. Johnson); Bull. U. S. Geol. Survey No. 140, 1896, pp. 264–266.

Basin Slope Creek (L); Tuolumne County; rises in the southern part of T. 2 N., R. 17 E., on the western slope of The Basin, at altitude 4,000 feet above sea level; flows south of west 3½ miles into North Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 1,800 feet. Sonora sheet.

Battle Creek (R); Tulare County; Sequoia National Forest; rises in the northeastern part of T. 18 S., R. 29 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows southwestward 3 miles into South Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 2,400 feet; intermittent; tributary, Bennett Creek. Kaweah sheet.

Baxter Creek (R); Fresno County; rises in Sierra National Forest, on the western slope of Mount Baxter (altitude 13,118 feet); flows southwestward 1 mile, then westward 2 miles, into South Fork of Woods Creek (tributary through Woods Creek to South Fork of Kings River and thus through Kings River to the San Joaquin); fall, 2,400 feet. Mount Whitney sheet.

Bean Creek (R); Mariposa County; rises in the southwestern part of T. 2 S., R. 17 E., Mount Diablo base and meridian; at altitude 3,200 feet above sea level; flows north of

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east 4½ miles into Smith Creek (tributary through North Fork of Merced River and thus to the San Joaquin); fall, 400 feet; principal tributary, Dutch Creek; intermittent. Sonora sheet.

Bean Gulch Creek (R); Madera County; rises in the northwestern part of T. 8 S., R. 20 E., Mount Diablo base and meridian, at altitude 1,600 feet above sea level; flows southeastward 3 miles into Fresno River (tributary to San Joaquin River); fall, 400 feet. Mariposa sheet.

Bear Creek (R); Calaveras County; rises in the eastern part of T. 7 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; flows, in general, southwestward 8 miles into Middle Fork of Mokelumne River (tributary through the Mokelumne to the San Joaquin); fall, 1,900 feet. Big Trees and Jackson sheets.

Bear Creek (L); Calaveras County; rises in the eastern part of T. 3 N., R. 11 E., Mount Diablo base and meridian, on the west slope of Bear Mountain, at altitude 2,500 feet above sea level; flows southeast 2½ miles, southwest 2 miles, northwest 7 miles to Calaveras River (tributary to San Joaquin River); fall, 1,900 feet. Jackson sheet.

Bear Creek (R); Fresno County; Sierra National Forest; formed by junction of East and South forks 5 miles east of the east boundary of T. 7 S., R. 27 E., Mount Diablo base and meridian. The South Fork drains the larger area and is here considered the continuation of the main stream. This fork rises on the western slope of the Pinnacles, flows northwestward to the junction of the East Fork, beyond which the creek continues in a northwesterly course about 3 miles, then turns and flows west and southwest to its junction with the San Joaquin; length of Bear Creek to the head of the South Fork, about 15 miles; total fall, 5,400 feet, well distributed throughout. This creek, like all the other headwater tributaries of the South Fork of San Joaquin River, derives much of its supply from glacial lakes high up on the slopes of the mountains. Only 3 of these lakes are named on the map, but about 50 are shown. Mount Goddard sheet.

Bear Creek (L); Fresno County; Sierra National Forest; rises in the northwestern part of T. 10 S., R. 27 E., Mount Diablo base and meridian, on the north slope of Nelson Mountain, in a glacial lakelet at altitude 9,300 feet above sea level; flows southwestward 6 miles into Dinkey Creek (tributary to North Fork of Kings River and thus through Kings River to the San Joaquin); fall, 3,300 feet; principal tributary, Laurel Creek. Kaiser sheet.

Bear Creek (L); Mariposa County; Sierra National Forest; rises in the northwestern part of T. 5 S., R. 19 E., Mount Diablo base and meridian, at altitude 3,100 feet above sea level; takes a general northwesterly course 7 miles to its junction with Merced River (tributary to San Joaquin River) at Bear Creek station on the Yosemite Valley railroad; fall, 1,900 feet. Yosemite sheet.

Bear Creek (R); Mariposa and Merced counties; rises in the central part of T. 4 S., R. 17 E.; takes a general southwesterly course to San Joaquin Valley, across which it flows into several channels; carries practically no water after the rainy season; principal tributary, Burns Creek; drainage area (W. Ham. Hall), 166 square miles. Gaging station at base of foothills (1878–1884). Fisk and Johnson map. Bull. U. S. Geol. Survey No. 140, 1895, p. 295.

Bear Creek (L); Tulare County; Sequoia National Forest; rises in the northeastern part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 7,500 feet above sea level; flows northwestward 2½ miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule River to Tule River and thus to Tulare Lake basin); fall, 3,000 feet. Gaging station near Daunt (1911–12). Kaweah sheet.

Bear Creek (L); Tulare County; Sequoia National Forest; rises in the southern part of T. 19 S., R. 30 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southwestward 7½ miles into North Fork of Tule River (tributary through Tule River to Tulare Lake basin); fall, 4,600 feet; principal tributary, Rancheria Creek. Kaweah sheet.

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Bear Creek (L); Tuolumne County; rises in the western part of T. 1 N., R. 14 E., Mount Diablo base and meridian, 3½ miles southwest of Rawhide on the west slope of Table Mountain, at altitude 1,400 feet above sea level; flows northwestward into Stanislaus River; length, about 5 miles; fall, 1,000 feet; intermittent. Sonora sheet.

Bear Creek, East Fork (R); Fresno County; rises in Sierra National Forest, 3 miles northwest of Pine Creek Pass at altitude 12,700 feet above sea level; flows south of west 4½ miles, passing through several lakes, to its junction with Bear Creek (tributary to South Fork of San Joaquin River); fall, 2,500 feet. The basin of this creek comprises less than 10 square miles and includes more than two dozen small lakes. Mount Goddard sheet.

Bear River (R); Amador County; rises in the central part of T. 9 N., R. 17 E., Mount Diablo base and meridian, at altitude 8,900 feet above sea level; flows southwestward 17 miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 5,600 feet; principal tributary, Tragedy Creek. Pyramid Peak and Big Trees sheets.

Beartrap Creek (R); Tulare County; Sequoia National Forest; rises in the western part of T. 14 S., R. 29 E., Mount Diablo base and meridian, on the east slope of Big Baldy Ridge, at altitude 7,500 feet above sea level; flows, in general, southeastward 4 miles into Stony Creek (tributary through North Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 1,250 feet. Tehipite sheet.

Bearup Lake; Tuolumne County; Yosemite National Park; northwestern corner of T. 2 N., R. 21 E., Mount Diablo base and meridian; inlet, Frog Creek; outlet, Frog Creek to Lake Eleanor on Eleanor Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); altitude, 7,550 feet. Yosemite National Park map.

Beasore Creek (R); Madera County; rises in the west-central part of T. 5 S., R. 23 E., Mount Diablo base and meridian; in a small lake at altitude 8,100 feet above sea level; flows southeastward 6 miles into Chiquito Creek (tributary to San Joaquin River); in Johnson Meadows in the western part of T. 6 S., R. 24 E.; fall, 3,100 feet; open meadow near head. Kaiser sheet.

Beaver Creek (R); Amador County; rises in the southern part of T. 8 N., R. 15 E., at altitude 6,000 feet above sea level; flows southward 2 miles, then southeastward 1 mile into Bear River (tributary through North Fork of Mokelumne River to Mokelumne River and thus to the San Joaquin); fall, 2,700 feet. Pyramid Peak and Big Trees sheets.

Beaver Creek (L); Tuolumne County; rises in the southeastern part of T. 6 N., R. 17 E., Mount Diablo base and meridian, at altitude 7,400 feet above sea level; flows southwestward 17 miles into North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus River and thus to the San Joaquin); fall, 4,900 feet, of which 1,000 feet is made in the last 1½ miles; drainage basin long and narrow; tributaries small and unimportant; the south grove of the Calaveras big trees lies on the divide between this creek and Griswold Creek. Big Trees sheet.

Beck Lakes; Madera County; eastern part of the Sierra National Forest, southeast of the Minarets and north of Iron Mountain; inlet, King Creek, which flows through the lakes to junction with Middle Fork of San Joaquin; two lakes connected by very short channel, the eastern, 10,010 feet above sea level, the western, 100 feet higher. Mount Lyell sheet.

Becknell Creek (L); Mariposa County; rises in the southeastern part of T. 6 S., R. 18 E., at altitude about 2,000 feet above sea level; flows southward 6 miles into Chapman Creek (tributary through Chowchilla River to the San Joaquin); fall, 1,000 feet. Mariposa sheet.

Belknap Creek (R); Tulare County; Sequoia National Forest; rises in the eastern part of T. 20 S., R. 31 E., Mount Diablo base and meridian, at altitude 8,500 feet above sea level; flows west of south 3½ miles into South Fork of Middle Fork of Tule

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River (tributary through Middle Fork of Tule to Tule River and thus to Tulare Lake basin); fall, 3,400 feet. Kaweah sheet.

Bench Canyon Creek (R); Madera County; rises in the northwestern part of the Sierra National Forest south of Foerster Peak, at altitude 11,000 feet above sea level; flows south of east 3 miles into North Fork of San Joaquin River (tributary to Middle Fork of San Joaquin); fall, 2,400 feet. Mount Lyell sheet.

Bench Lake; Fresno County; Sierra National Forest, 4 miles west of Mount Pinchot; outlet, a stream half a mile long flowing northward into South Fork of Kings River (tributary to San Joaquin River); altitude, 10,485 feet; fall of outlet, 900 feet. Mount Whitney sheet.

Bench Lakes; Fresno County; Sierra National Forest, west of Goat Crest; three small glacial lakes connected by channels less than half a mile long, discharging by a stream flowing west and then north to the Middle Fork of Dougherty Creek (tributary through Dougherty Creek to Middle Fork of Kings River and thus through Kings River to the San Joaquin); the highest of the lakes is 10,300 feet above sea level, the lowest is 10,050 feet; the group also includes a small lake without outlet, lying one-third mile south of the others. Tehipite sheet.

Bennett Creek (L); Tulare County; Sequoia National Forest; rises in the northwestern part of T. 18 S., R. 30 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows westward 2 miles and southwestward 1 mile into Battle Creek (tributary through South Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 3,100 feet; intermittent. Kaweah sheet.

Benson Lake; Tuolumne County; Yosemite National Park; eastern part of T. 2 N., R. 22 E., Mount Diablo base and meridian; inlet, Piute Creek, which flows through the lake to its junction with Tuolumne River (tributary to the San Joaquin), and a stream from Smedberg Lake; altitude, 8,050 feet; fall of Piute Creek in the 8 miles below the lake, 3,600 feet; the lake is about three-fourths mile long and one-third mile in maximum width. Yosemite National Park map.

Beulah Lake; Tuolumne County; Stanislaus National Forest; 2 miles north of west from the south end of Emigrant Lake and 2½ miles south of Granite Dome; one inlet; outlet, a stream 3 miles long flowing, in general, southwestward and passing through three small lakes to its junction with West Fork of Cherry Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); altitude, 8,700 feet; fall of outlet above the West Fork, 800 feet. Yosemite National Park map.

Big Arroyo (R); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 15 S., R. 32 E., Mount Diablo base and meridian, in a small lake on the eastern slope of the Great Western Divide, at altitude 11,100 feet above sea level; flows, in general, southeastward 14 miles to its junction with Kern River near Funston Camp; fall, 4,500 feet; principal tributaries Soda and Willow creeks, and a stream from the Five Lakes; the head of the stream lies in the Ninelake basin. Tehipite, Kaweah, and Olancha sheets.

Big Canyon Creek. *See* Canyon Creek, Big.

Big Creek (L); Fresno County, formed in the eastern part of T. 8 S., R. 26 E., Mount Diablo base and meridian, by the junction of the East and South forks; the South Fork rises in Hot Springs Pass (elevation, 9,778 feet); flows irregularly westward 3 miles through Rock Meadow to head of Long Meadow, where it turns and flows northward to its junction with the East Fork; the length of this branch is about 6 miles and the fall above the junction is 1,000 feet; the East Fork rises on the south slope of Kaiser Ridge, just south of the line between Ts. 7 and 8 S., at altitude 10,000 feet above sea level; flows southward 2 miles, then southwestward 3 miles to its junction with the South Fork. The fall of this branch above the junction is 1,600 feet. Below the junction Big Creek flows very irregularly westward about 15 miles; it unites with the San Joaquin in the central part of T. 8 S., R. 24 E.; fall below the East and South forks,

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6,400 feet; lower course lies through a deep canyon; upper part of drainage area, open; the basin contains a number of small lakes, three of which—Nellie, Red, and Coyote lakes—are named on the map; principal tributary below the South and East forks, North Fork. Kaiser sheet.

Big Creek (R); Fresno County; Sierra National Forest; rises in the northwestern part of T. 10 S., R. 25 E., Mount Diablo base and meridian, in Summit Meadow, at altitude 6,000 feet above sea level; takes a general southerly course to its junction with Kings River (tributary to the San Joaquin); principal tributary, Rush Creek; length, 15 miles. Gaging station at Tollhouse (1910–1912). Kaiser sheet; Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Big Creek (L); Mariposa County; rises in the eastern part of T. 5 S., R. 22 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows southwestward 3 miles, then northwestward 10 miles into South Fork of Merced River (tributary to the San Joaquin); fall, about 4,500 feet; water from this creek is diverted to the basin of Fresno River by the lumber company's flume. Gaging station at Sugarpine (1910–1912). Mariposa and Yosemite sheets.

Big Creek (L); Tuolumne County; rises near Smith station, in the western part of T. 1 S., R. 17 E., at altitude 2,800 feet above sea level; flows northwestward 9 miles into Tuolumne River (tributary to San Joaquin River); fall, 1,600 feet, of which 800 feet occurs in little more than a mile at the entrance to Tuolumne River; upper valley broad and open. Sonora sheet.

Big Creek, East and South forks, Fresno County. See *Big Creek*.

Big Creek, North Fork (R); Fresno County; rises in the southern part of T. 7 S., R. 26 E., Mount Diablo base and meridian, on the south slope of Kaiser Ridge, near Kaiser Pass, at altitude 9,200 feet above sea level; flows southwestward 6 miles into Big Creek (tributary to San Joaquin River); fall, 2,400 feet. Kaiser sheet.

Big Grizzly Creek. *See* Grizzly Creek, Big.

Big Humbug Creek. *See* Hambug Creek, Big.

Big Indian Creek. *See* Indian Creek, Big.

Big Meadow Creek. *See* Meadow Creek, Big.

Big Sandy Creek. *See* Sandy Creek, Big.

Bishop Creek (R); Mariposa County; Yosemite National Park; rises in the central part of T. 3 S., R. 21 E., at altitude 7,600 feet above sea level; flows southwestward 5 miles into South Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 4,300 feet. Yosemite National Park map.

Bitter Creek (L); Kern County; rises in the southeastern part of T. 10 N., R. 24 W., at altitude 4,000 feet above sea level; flows eastward 2 miles, then northward toward Buena Vista Lake Reservoir, in San Joaquin Valley. Mount Pinos sheet.

Bitter Creek (R); Tulare County; Sierra National Forest; rises in the northern part of T. 22 S., R. 35 E., Mount Diablo base and meridian, at altitude 6,700 feet above sea level; flows eastward 2½ miles into South Fork of Kern River (tributary to Kern River); fall, 1,100 feet. Olancha sheet.

Black Creek (R); Calaveras County; rises in the southern part of T. 2 N., R. 12 E., Mount Diablo base and meridian; flows southeastward into Stanislaus River (tributary to San Joaquin River); length, 8 miles. Land Office map of California, 1907.

Black Peak Fork (R); Madera County; rises in the Sierra National Forest, on the north slope of Black Peak (altitude, 10,507 feet); flows northeastward 4 miles into West Fork of Granite Creek (tributary through Granite Creek to San Joaquin River); fall, 2,400 feet; tributaries, stream from Lillian Lake and several unnamed streams. Mount Lyell sheet.

Blacks Creek (R); Mariposa County; rises in the western part of T. 2 S., R. 16 E., at altitude 2,600 feet above sea level; flows southward 3 miles, then southwestward 1 mile into Maxwell Creek (tributary through Merced River to San Joaquin River); fall, 1,100 feet; intermittent. Sonora sheet.

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Blade Creek (R); Mariposa County; rises in the central part of T. 6 S., R. 19 E., at altitude 2,000 feet above sea level; flows southeastward 4 miles into West Fork of Chowchilla River (tributary through Chowchilla River to the San Joaquin); fall, 800 feet. Mariposa sheet.

Blanket Creek (L), Tuolumne County; rises in the southeastern part of T. 1 N., R. 15 E., Mount Diablo base and meridian, at altitude 1,850 feet above sea level; flows westward 2 miles into Rough and Ready Creek (tributary through Tuolumne River to San Joaquin); fall, 200 feet; intermittent. Sonora sheet.

Bloods Creek (R); Alpine and Calaveras counties; Stanislaus National Forest; rises 4 miles northwest of Highland Reservoir and 1 mile northwest of Silver Valley, at altitude 8,000 feet above sea level; flows southwestward 5½ miles, passing through Bear Valley, into North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus River and thus to the San Joaquin); fall, 1,900 feet. Big Trees sheet.

Blue Canyon Creek (R); Fresno County; Sierra National Forest; rises in a group of glacial lakelets on the west slope of Blue Canyon Peak (altitude 11,838 feet); flows, in general, southwestward 7½ miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 6,400 feet, of which 2,800 feet is made in the last mile. Mount Goddard and Tehipite sheets.

Blue Creek (L); Calaveras County; Stanislaus National Forest; rises in the southwestern part of T. 7 N., R. 17 E., Mount Diablo base and meridian, at altitude 6,800 feet above sea level; flows somewhat north of west 14 miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 3,800 feet. Big Trees sheet.

Blue Lakes; Alpine County; Stanislaus National Forest; one inlet; outlet, Deer Creek to North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); two lakes, each nearly a mile long, connected by a channel one-half mile long; altitude of the lower lake (called East Lake on the Land Office map) 8,500 feet; altitude of the upper lake (West Lake) 8,625 feet. Markleeville sheet.

Bodfish Creek (L); Kern County; Sierra National Forest; rises in the southern part of T. 27 S., R. 33 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows northwestward 7 miles to its junction with Kern River near Vaughn; fall, 3,600 feet. Kernville sheet.

Bog Creek (R); Tulare County; rises in the northwestern part of T. 15 S., R. 31 E., in Long Meadow, at altitude 10,300 feet above sea level; flows northward 7½ miles into Sugarloaf Creek (tributary through Roaring River to South Fork of Kings River) near the lower end of Sugarloaf Valley; fall, 3,500 feet; principal tributary, West Fork. Tehipite sheet.

Bold Creek. *See* Sandy Creek, Big.

Bonell Gulch Creek (L); Mariposa County; Stanislaus National Forest, rises in the eastern part of T. 3 S., R. 18 E., Mount Diablo base and meridian, at altitude 3,500 feet above sea level; flows northwestward 3 miles into Bull Creek (tributary through North Fork of Merced River to Merced River and thus to the San Joaquin) at Kinsley; fall, 700 feet. Yosemite sheet.

Bonito Creek (L); Tulare County; Kern National Forest; rises in the northwestern part of T. 22 S., R. 34 E., Mount Diablo base and meridian, in Bonito Meadows, at altitude 8,300 feet above sea level; flows eastward 1½ miles into Rattlesnake Creek (tributary to Kern River); fall, 800 feet. Olancha sheet.

Boulder Creek (R); Alpine County; Stanislaus National Forest; rises in the western part of T. 7 N., R. 21 E., Mount Diablo base and meridian, at altitude 8,600 feet above sea level; flows southward 2 miles into Clark Fork (tributary through Middle Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); fall, 1,600 feet. Dardanelles sheet.

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Boulder Creek (L); Tulare and Fresno counties; Sequoia National Forest; in the southwestern part of T. 14 S., R. 30 E., Mount Diablo base and meridian, at altitude 9,350 feet above sea level; flows, in general, northwestward 10 miles to its junction with South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 6,000 feet; principal tributary, Big Meadow Creek. Tehipite sheet.

Boundary Creek (L); Madera County; rises in the eastern part of the Sierra National Forest, near Mammoth Pass, at altitude 9,200 feet above sea level; flows westward 2 miles into Middle Fork of San Joaquin River in Reds Meadows; fall, 1,850 feet. Mount Lyell sheet.

Branigan Lake; Tuolumne County; Yosemite National Park, western part of T. 2 N., R. 21 E., Mount Diablo base and meridian; inlets from two lakes, one west and one south of Andrews Peak; outlet, a stream 2 miles long flowing southwestward to Falls Creek (tributary through Tuolumne River to the San Joaquin) just above Vernon Lake; altitude, 7,350 feet; fall of outlet, 700 feet. Yosemite National Park map.

Breeze Creek (R); Tuolumne County; Yosemite National Park; rises in the west central part of T. 2 N., R. 22 E., Mount Diablo base and meridian, 1 mile west of Piute Mountain, at altitude 9,500 feet above sea level; takes a circuitous but in general southwesterly course to its junction with Deep Canyon Creek, through which it enters Rancheria Creek (tributary through Tuolumne River to the San Joaquin); fall, 2,800 feet. Yosemite National Park map.

Breeze Lake; Madera County; Yosemite National Park, eastern part of T. 4 S., R. 23 E., just north of Gale Peak; outlet, a stream 2 miles long flowing northwestward to South Fork of Merced River (tributary through Merced River to the San Joaquin); altitude, 9,600 feet. Yosemite National Park map.

Brewer Creek (R); Tulare County; rises in the central part of T. 14 S., R. 32 E., on the western slope of Mount Brewer (altitude 13,577 feet); flows westward about 4 miles into Roaring River (tributary to South Fork of Kings River); fall, about 4,500 feet. Tehipite sheet.

Bridalveil Creek (L); Mariposa County; Yosemite National Park; rises in the northern part of T. 4 S., R. 22 E., at altitude 8,100 feet above sea level; flows northwestward 10 miles into Merced River (tributary to San Joaquin River) at the lower end of Yosemite Valley; fall, about 4,000 feet. The falls by which it enters the valley are world famous. Yosemite National Park map.

Brin Canyon Creek (L); Tulare County; Sierra National Forest; rises in the northwestern part of T. 23 S., R. 33 E., Mount Diablo base and meridian, at altitude 5,700 feet above sea level; flows westward 2 miles into Kern River; fall, 2,100 feet. Kernville sheet.

Browns Creek (L); Madera County; rises in the central part of T. 7 S., R. 23 E., in Browns Meadow, at altitude 6,500 feet above sea level; flows southwestward 4 miles into South Fork of Little North Fork of San Joaquin River, at the junction with Sand Creek; fall, 2,900 feet. Kaiser sheet.

Brush Canyon Creek (R); Fresno County; Sierra National Forest; rises in the eastern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, at altitude 8,500 feet above sea level; flows southeastward 2 miles, then southward 1 mile into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 6,000 feet, of which 2,500 feet is made in the last mile. Tehipite sheet.

Brush Creek (L); Tulare County; Sierra National Forest; rises in the northwestern part of T. 23 S., R. 34 E., Mount Diablo base and meridian, at altitude 9,100 feet above sea level; flows northwestward 3½ miles, then irregularly westward 5 miles into Kern River, which it enters in the southeastern part of T. 22 S., R. 32 E.; fall, 5,300 feet. Kernville sheet.

Bubbs Creek (L); Tulare County; rises in Sierra National Forest, 3 miles south of the Fresno County line, on the western slope of the Sierra, at altitude 12,115 feet

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above sea level; flows northwestward about 15 miles to its junction with South Fork of Kings River, near the head of Kings River Canyon; fall, about 7,000 feet; principal tributaries, Vidette, East, North Guard, Charlotte, and Sphinx creeks; basin contains many lakes. Mount Whitney and Tehipite sheets.

Buck Canyon Creek (R); Tulare County, Sequoia National Forest; rises in the western part of T. 15 S., R. 31 E., Mount Diablo base and meridian, in Moose Lake at altitude 10,550 feet above sea level; flows, in general, southwestward 6 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 5,700 feet. Tehipite sheet.

Buck Creek (R); Madera County; Yosemite National Park, rises on the western part of T. 4 S., R. 23 E., at altitude 8,500 feet; flows southward 2 miles into South Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 1,800 feet. Yosemite National Park map.

Buckeye Creek (L); Mariposa County; rises near Mariposa at altitude 2,500 feet above sea level; flows southward into Agua Fria Creek, tributary through Mariposa Creek to the San Joaquin. Mariposa sheet.

Budd Creek (L); Tuolumne County; Yosemite National Park, rises in the western part of T. 1 S., R. 24 E., Mount Diablo base and meridian, in a small lake on the south slope of Cathedral Peak, at altitude 9,950 feet above sea level; flows east of north 2½ miles into Tuolumne River (tributary to San Joaquin River); fall, 1,400 feet. Yosemite National Park map.

Buena Vista Creek (L); Mariposa County; Yosemite National Park, rises on the north slope of Buena Vista Peak (altitude, 9,777 feet); flows northward 4 miles into Illilouette Creek (tributary through Merced River to San Joaquin River); fall, 1,800 feet. Yosemite National Park map.

Buena Vista reservoir; Kern County, southeast of Tulare Lake; receives surplus waters from Kern River and the waste of the tail end of all Kern Island canals. The reservoir occupies the north end of what was formerly Buena Vitsa Lake. It was formed by constructing a dike or levee 5.5 miles long on the township line passing the east end of the old lake bed. A railroad was built across the levee connecting Bakersfield with Sunset. Portions of this levee have within recent years been washed out, flooding large areas on the lake bed, which had been brought under cultivation. In years of extremely high stream flow water from the reservoir passes northward toward the Tulare Lake basin and may possibly reach Tulare Lake itself. It is said that previous to 1906 no water from Kern River had reached Tulare Lake for 25 years. The bed of Kern Lake, which formerly received part of the flood waters of Kern River, is now under cultivation. Fisk and Johnson map.

Bull Creek (L); Mariposa County; Stanislaus National Forest, rises in the central part of T. 2 S., R. 19 E., Mount Diablo base and meridian, west of the Merced Grove of big trees, at altitude 5,500 feet above sea level; takes a general southwesterly course 10 miles to its junction with North Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 3,500 feet; many short tributaries. Yosemite and Sonora sheets.

Bullfrog Lake; Fresno County; Sierra National Forest, 1½ miles west of Kearsarge Pass; inlet, stream from Kearsarge Lakes; outlet, a stream less than a mile long, flowing west of south to Bubbs Creek (tributary to South Fork of Kings River); altitude, 10,634 feet; fall of outlet, 1,000 feet. Mount Whitney sheet.

Bullrun Creek (R); Tulare and Kern Counties; Sierra National Forest; rises in the northwestern part of T. 24 S., R. 32 E., Mount Diablo base and meridian; flows southeastward 6 miles, then northeastward 2 miles into Kern River. Land Office map of California, 1907; Kernville sheet.

Burns Creek (L); Mariposa County; rises in the southeastern part of T. 4 S., R. 16 E.; flows southwestward into Bear Creek (tributary to the San Joaquin); fall, 500 feet; intermittent. Sonora sheet.

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Burnt Camp Creek (R); Tulare County; Sequoia National Park; rises in the western part of T. 18 S., R. 30 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southwest 2 miles into South Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 2,700 feet; intermittent. Kaweah sheet.

Burnt Corral Creek (R); rises 1 mile north of the north line of T. 9 S., R. 28 E., Mount Diablo base and meridian, at altitude 10,000 feet above sea level; flows, in general, southward 5 miles into Post Corral Creek (tributary through North Fork of Kings River to Kings River and thus to the San Joaquin); fall, 1,800 feet. Mount Goddard sheet.

Burton Lake; Sacramento County; 1½ miles west of the junction of Cosumnes River with the Mokelumne; a water body 3 miles long, connected with Mokelumne River by a short channel, fed by overflow from the Mokelumne. Lodi sheet.

Butte Creek (R); Eldorado County; rises in the southwestern part of T. 10 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,500 feet above sea level; flows southwest 4 miles into North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,400 feet. Placerville sheet.

Cabin Creek (L); Fresno County; Sequoia National Forest; rises in the southwestern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, 2 miles northeast of Sanger Sawmill, at altitude 5,500 feet above sea level; flows northwestward 2 miles into Kings River (tributary to the San Joaquin); fall, 4,000 feet. Tehipite sheet.

Cactus Creek (L); Tulare County; Sequoia National Park; rises in the central part of T. 15 S., R. 29 E., Mount Diablo base and meridian, on the south slope of Pine Ridge, at altitude 7,000 feet above sea level; flows southward 2 miles, then southwestward 5 miles into North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 5,200 feet; tributaries, Cedar and Maple creeks. Tehipite sheet.

Calaveras River (R); formed near San Andreas, in Calaveras County, by the confluence of its North and South forks. The South Fork, which drains the larger area and is here considered the continuation of the main stream, rises on the east slope of Harmon Peak, in the southern part of T. 2 N., R. 12 E., Mount Diablo base and meridian, at altitude 2,000 feet above sea level, and flows, in general, northwestward 13 miles to its junction with the North Fork, from which the main stream flows southwestward, uniting with the San Joaquin a few miles west of Stockton; total length, about 80 miles—35 miles in the valley and 45 miles in the mountains; drainage area above the border of the San Joaquin Valley about 500 square miles.

The basin is almost wholly a foothill region; the highest point is 6,000 feet in altitude, but only a very small part exceeds 4,000 feet. The hills are low and separated by small irregular valleys.

In the lower foothills vegetation consists of grass, brush, and scrubby timber, chiefly oak; the upper part of the basin supports a heavy growth of timber. The Calaveras grove of big trees (*Sequoia gigantea*) is partly in this basin and partly in the Stanislaus basin to the south.

The mean annual precipitation ranges from about 15 inches in the valley to 22 inches in the low foothills and 35 or 40 inches in the upper part of the basin; the little snow that falls in this area quickly disappears.

The river is torrential in winter and dry for a few months during the summer. It is not especially suitable for irrigation unless assisted by storage.

Gaging station near Bellota (1878–1884), at Jenny Lind (1907–1912).

Surveys and data: Calaveras, Jackson, and Lodi sheets. Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 211–212.

Calaveras River, North Fork (R); rises in the northern part of T. 5 N., R. 14 E., Mount Diablo base and meridian, in Calaveras Valley, at altitude 3,100 feet above sea level; flows north of west 6 miles, then very irregularly and with many bends and turns southwestward 15 miles to its junction with the South Fork of Calaveras River

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(tributary to Calaveras River) 2 miles west of San Andreas; fall, 2,300 feet; principal tributaries, Esperanza and Jesus Maria creeks. Big Trees and Jackson sheets.

Calaveritas Creek (R); Calaveras County; formed by the junction of O'Neil and McKinneys creeks, in the central part of T. 4 N., R. 13 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows southwest 5 miles, then north of west 5 miles into South Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 600 feet. *See* O'Neil Creek. Big Trees and Jackson sheets.

Caliente Creek (R); rises in the eastern part of T. 30 S., R. 32 E., Mount Diablo base and meridian, at the south end of the Sierra, and flows northwestward to a point near Pampa, then southwestward into the lower end of San Joaquin Valley; principal tributaries, Tehachapi and Basin creeks.

The basin of Caliente Creek proper is characterized by sandy soil and slopes that are somewhat less steep than those in Basin and Tehachapi creeks. Many of the canyons are narrow, but more are broad and flat and afford a large area of absorbent material to take up any water than may start down their courses. This stream, and other streams flowing from the Tehachapi Mountains toward Buena Vista reservoir, begins to sink as soon as it leaves the box canyons in the mountains. The surface water of the stream during the late summer does not reach far into the plains to renew the loss by evaporation from the absorbing sands. During the winter the floods are so large as to do considerable damage, and several persons have been drowned in the creek. Gaging station at base of foothills (1911). Manuscript map of San Joaquin Valley (compiled by A. J. Fisk, jr., and H. R. Johnson); Bull. U. S. Geol. Survey No. 140, 1896, pp. 264–266.

Camanche Creek (L); Calaveras County; rises in the southern part of T. 3 N., R. 9 E., Mount Diablo base and meridian; at altitude 600 feet above sea level; flows irregularly northwestward into Mokelumne River (tributary to San Joaquin River); length, 4 miles; fall, 300 feet. Jackson sheet.

Camp Creek (R); Eldorado County; rises in the northwestern part of T. 9 N., R. 16 E., Mount Diablo base and meridian, 1½ miles north of the head of the North Fork of the Cosumnes, at altitude 7,000 feet above sea level; flows, in general, northwestward 16 miles, then southwestward 10 miles into North Fork of Cosumnes River (tributary through Cosumnes River to the Mokelumne and thus to the San Joaquin); fall, 5,200 feet; principal tributaries, Stonebreaker and Sly Park creeks. Pyramid Peak and Placerville sheets.

Camp Creek (L); Tuolumne County; Yosemite National Park; rises in the northern part of T. 2 N., R. 23 E., Mount Diablo base and meridian, at altitude 9,800 feet; flows north of west 1½ miles into Piute Creek (tributary through Tuolumne River to the San Joaquin); fall, 900 feet. Yosemite National Park map.

Campbell Creek (R); Tulare County; rises in the eastern part of T. 20 S., R. 28 E., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows southeastward 6 miles into Tule River (tributary to Tulare Lake basin); fall, 450 feet; intermittent. Kaweah sheet.

Canebrake Creek (L); Kern County; Sierra National Forest; rises in the southwestern part of T. 26 S., R. 37 E., Mount Diablo base and meridian, at altitude 6,200 feet above sea level; flows west of north about 8½ miles, then west and southwest 2½ miles into Chimney Creek (tributary through South Fork of Kern River to Kern River); fall, 3,200 feet; intermittent in lower part of course. Kernville sheet.

Cane Canyon Creek (R); Kern County; Sierra National Forest; rises in the north-central part of T. 27 S., R. 36 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southwestward 2 miles, then north of west 5 miles into Kelso Creek (tributary to South Fork of Kern River); fall, 3,000 feet; intermittent. Kernville sheet.

Cannell Creek (L); Tulare and Kern counties; Sierra National Forest; rises in the western part of T. 24 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,000

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feet above sea level; flows somewhat west of south 4½ miles, then north of west 4½ miles to Kern River; fall, 5,200 feet; in its east-west stretch crosses boundary between Tulare and Kern counties several times; near its head is Cannell Meadow. Kernville sheet.

Canoas Creek (L); Fresno County; rises in the northwestern part of T. 23 S., R. 16 E.; flows northeastward into San Joaquin Valley; length, 10 miles; sinks on leaving the foothills; carries water only during the rainy season. Manuscript map of San Joaquin Valley (compiled by Fisk and Johnson); Land Office map of California, 1907.

Cantua Creek (L); Fresno County; rises in the northeastern part of T. 18 S., R. 12 E.; flows north of east 18 miles into San Joaquin Valley; sinks below the foothills; principal tributary, Salt Creek; carries no water after the rainy season.

Canyon Creek, Big (L); Eldorado County; rises in the southwestern part of T. 9 N., R. 11 E., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows, in general, southwestward 3½ miles into North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 800 feet. Placerville sheet.

Canyon Creek, Big (R); Eldorado County; rises in the northern part of T. 9 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows west of south 11 miles into Cosumnes River (tributary through Mokelumne River to the San Joaquin); fall, 1,200 feet; principal tributaries, Slate and French creeks. Placerville sheet.

Cardinal Lake; Fresno County; Sierra National Forest, west slope of Cardinal Mountain (elevation 13,388 feet); outlet, a stream 1 mile long flowing southwestward to South Fork of Kings River; altitude 11,447 feet; fall of outlet, 1,000 feet. Mount Whitney sheet.

Cargyle Creek (R); Madera County; rises in the Sierra National Forest on the south slope of Iron Mountain (altitude 11,157 feet); flows southward 5 miles into North Fork of San Joaquin River (tributary to Middle Fork of San Joaquin) just above Junction Butte; fall, 5,000 feet; several small unnamed tributaries. Mount Lyell sheet.

Carson Creek (R); Calaveras County; rises in the northeastern part of T. 2 N., R. 13 E., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows, in general, south of west 5 miles to its junction with Stanislaus River (tributary to the San Joaquin); fall, 1,000 feet. Jackson sheet.

Carson Creek (R); Eldorado and Sacramento counties; rises in the southeastern part of T. 10 N., R. 8 E., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows very irregularly southwestward into Deer Creek (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); length, 12 miles; fall, 800 feet, of which 500 feet occurs in the first 3 miles. Sacramento sheet.

Carter Creek (L); Mariposa County; rises in the north central part of T. 6 S., R. 21 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; takes a general course south of west about 5 miles to its junction with Peterson Creek (tributary through North Fork of Fresno River to Fresno River and thus to the San Joaquin) near Hills ranch; fall, 2,300 feet. Mariposa sheet.

Cartridge Creek (L); Fresno County; Sierra National Forest; rises in Sixteen Lake basin, at altitude 11,050 feet above sea level; flows northwestward 5 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 4,000 feet. Tehipite sheet.

Cartridge Creek, South Fork (L); Fresno County; Sierra National Forest; rises on the north slope of Cirque Crest, at altitude 12,000 feet above sea level; flows west of north 3 miles into Cartridge Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); fall, 4,000 feet. Tehipite sheet.

Cascade Creek (R); Mariposa County; Yosemite National Park; rises in the southern part of T. 1 S., R. 21 E., Mount Diablo base and meridian, at altitude 8,800 feet above sea level; flows southwestward 9 miles, then southeastward 2 miles to its junc-

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tion with Merced River (tributary to San Joaquin River) at the lower end of Yosemite Valley; fall, 4,800 feet, of which 2,000 feet occurs in the last mile; principal tributary, Tamarack Creek. Yosemite National Park map.

Cascade Creek (L); Tuolumne County; Stanislaus National Forest; rises 4 miles west of Eagle Peak, at altitude 7,600 feet above sea level; flows westward 4½ miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 3,900 feet, of which 1,300 feet is made in the last half mile. Dardanelles and Big Trees sheets.

Castac Lake; Kern County; southern part of the Castac grant; Cuddy Canyon Creek approaches the lake from the west, but has seldom, even in flood, been seen to discharge into it; the lake seldom overflows the divide (altitude 3,500 feet above sea level) between it and Grapevine Creek, which is only 12 feet above the ordinary water level. Tejon sheet; Bull. U. S. Geol. Survey No. 140, 1896, pp. 256–257.

Castle Creek (L); Tulare County; Sequoia National Park; rises in the southeastern part of T. 16 S., R. 30 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows northward 4 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,800 feet; intermittent at head. Kaweah and Tehipite sheets.

Cat Creek (R); Eldorado County; rises in the central part of T. 9 N., R. 15 E., Mount Diablo base and meridian, on the south slope of Leek Spring Hill (altitude 7,640 feet); flows southwestward 5 miles into Middle Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River, and thus to the San Joaquin); fall, 2,500 feet. Pyramid Peak sheet.

Cataract Creek (L); Fresno County; Sierra National Forest; rises in Amphitheater Lake, on west slope of the Palisades, 10,700 feet above sea level; flows west of north 2 miles into Palisade Creek (tributary to Middle Fork of Kings River, and thus through Kings River to the San Joaquin); fall, 1,900 feet. Mount Goddard sheet.

Cathedral Creek (L); Tuolumne County; Yosemite National Park; rises in the northeastern part of T. 1 S., R. 23 E., Mount Diablo base and meridian, one-half mile west of Fairview Dome, at altitude 8,300 feet above sea level; takes a general northwesterly course about 7½ miles to its junction with the Tuolumne River (tributary to San Joaquin River); fall, 3,100 feet; principal tributary, South Fork. Yosemite National Park map.

Cathedral Creek, South Fork (L); Tuolumne County; Yosemite National Park; rises in the western part of T. 1 S., R. 23 E., Mount Diablo base and meridian, on the south slope of Tuolumne Peak, at altitude 10,500 feet above sea level; flows northward 4 miles into Cathedral Creek (tributary through Tuolumne River to the San Joaquin); fall, 3,200 feet. Yosemite National Park map.

Cathedral Fork (R); Mariposa County; Yosemite National Park; rises in Cathedral Pass at altitude 9,700 feet above sea level; flows southward 4½ miles into Echo Creek; fall, 1,500 feet. Yosemite National Park map.

Cathedral Lake; Mariposa County; Yosemite National Park, 1 mile west of Cathedral Peak; outlet, Tenaya Creek to Merced River (tributary to San Joaquin River); altitude, 9,250 feet, in the 2 miles between Cathedral Lake and Tenaya Lake, Tenaya Creek falls about 1,100 feet. Yosemite National Park map.

Cedar Canyon Creek (R); Eldorado County; rises in the northern part of T. 9 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,800 feet above sea level; flows southwestward 3 miles into Steeley Fork of North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,100 feet; principal tributary, String Canyon Creek. Placerville sheet.

Cedar Creek (R); Eldorado County; rises in the north central part of T. 8 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,400 feet above sea level; flows westward 4 miles, then southwestward 4 miles into South Fork of Cosumnes

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River (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 1,400 feet; called Brownsville Creek on Punnett's map of Eldorado County, on which the name Cedar Creek is applied to a northern branch of the stream. Placerville sheet.

Cedar Creek (L); Stanislaus County; rises in the southeastern part of T. 4 S., R. 5 E.; flows southeastward 4 miles into Ingram Creek (tributary to San Joaquin River). Orestimba-Panoche-Cantua special map.

Cedar Creek (L); Tulare County; Sequoia National Park; rises in the northern part of T. 16 S., R. 29 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows westward 2 miles into Cactus Creek (tributary through North Fork of Kaweah River to Kaweah River and thus to Tulare Lake Basin); fall, 2,500 feet. Tehipite sheet.

Chagoopa Creek (L); Tulare County; Sequoia National Forest; rises in the east central part of T. 16 S., R. 32 E., Mount Diablo base and meridian, on the east slope of Kaweah Peaks, at altitude 12,400 feet above sea level; flows, in general, southeastward 6 miles into Funston Creek (tributary to Kern River); fall, 4,200 feet. Though the maps (Mount Whitney and Olancha sheets) show Chagoopa Creek a tributary to Funston it is much longer than the latter creek and drains a much larger area and might, therefore, more properly be considered the principal stream and Funston Creek the tributary.

Chapman Creek (R); Mariposa County; rises in the southern part of T. 6 S., R. 18 E., south of Moore Hill (altitude 2,600 feet); flows in general somewhat east of south to its junction with Chowchilla River in the northeastern part of T. 8 S., R. 18 E.; length from Chowchilla River to the head of the West Branch (considered the continuation of the main stream) about 7 miles; fall, about 1,400 feet. The East Branch of Chapman Creek is called Becknell Creek. Mariposa sheet.

Charlotte Creek (R); Fresno County; rises in Sierra National Forest, on Mount Bago (altitude 11,868 feet); flows northwestward 1½ miles through Charlotte Lake, then south of west 2½ miles into Bubbs Creek (tributary to South Fork of Kings River); fall, below Charlotte Lake (altitude, 10,406 feet), 2,900 feet. Mount Whitney sheet.

Charlotte Lake; Fresno County; Sierra National Forest, northeast base of Mount Bago; inlet, Charlotte Creek; outlet, Charlotte Creek to Bubbs Creek (tributary to South Fork of Kings River); altitude, 10,406 feet. Mount Whitney sheet.

Cherokee Creek (R); Calaveras County; rises 1½ miles northwest of Altaville in the western part of T. 3 N., R. 13 E., Mount Diablo base and meridian, at altitude 1,600 feet above sea level; flows southwestward 2½ miles, then northwestward 4½ miles into South Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 500 feet. Jackson sheet.

Cherry Creek (R); Tuolumne County; Stanislaus National Forest, formed by the junction of North and East Forks in a triangle at the base of Gillett Mountain, Mercur Peak, and Bartlett Peak. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the western part of T. 4 N., R. 21 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level and flows southwestward about 9 miles, falling in this distance 2,700 feet; the principal tributary of this fork is the stream from Emigrant Lake; the East Fork rises in the eastern part of T. 4 N., R. 21 E., on the south slope of Grizzly Peak at altitude 9,800 feet above sea level and flows southwestward 13 miles, passing through Helen and Huckleberry Lakes and falling in this distance 2,900 feet; below the forks Cherry Creek takes an irregular but, in general, southwesterly course to its junction with Tuolumne River (tributary to San Joaquin River); length from the head of North Fork to Tuolumne River, 35 miles; fall in this distance, 7,100 feet; fall below the forks, 4,500 feet; principal tributaries below the North and East forks, West Fork and Eleanor Creek; the headwaters drain many small lakes. Gaging station at Eleanor trail crossing (1901). Yosemite National Park map.

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Cherry Creek, East Fork. *See* Cherry Creek.

Cherry Creek, North Fork. *See* Cherry Creek.

Cherry Creek, West Fork (R); Tuolumne County; Stanislaus National Forest; rises in upper Relief Valley 2 miles northwest of Granite Dome, at altitude 9,000 feet above sea level; flows southwestward 15 miles to its junction with Cherry Creek (tributary through Tuolumne River to the San Joaquin); fall, 4,000 feet; maximum width of the basin, about 5 miles; tributaries few and unimportant; basin contains a number of lakes some of which are mapped as without outlet; the only one named on the map is Beulah. Yosemite National Park sheet.

Chili Gulch Creek (R); rises in the northwestern part of T. 5 N., R. 12 E., Mount Diablo base and meridian, south of Mokelumne Hill, at altitude 1,700 feet above sea level; flows southwestward 4 miles, then southeastward 3 miles into North Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 1,000 feet. Jackson sheet.

Chilkoot Lake; Madera County; western part of T. 6 S., R. 23 E.; one inlet; outlet, Willow Creek to Little North Fork of San Joaquin River; altitude, 7,500 feet; nearly one-half mile long and wide. Kaiser sheet.

Chilnualna Creek (R); Mariposa County; Yosemite National Park; rises in the northern part of T. 4 S., R. 22 E., on the south slope of Horse Ridge, at altitude 9,500 feet above sea level; flows southwestward 8 miles into South Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 5,300 feet, of which 1,600 feet is made in less than a mile. Yosemite National Park map.

Chimney Creek (L); Tulare and Kern counties; Sierra National Forest; rises in the northwestern part of T. 24 S., R. 37 E., Mount Diablo base and meridian, in Chimney Meadow, at altitude 6,100 feet above sea level; flows, in general, southwestward 14 miles to its junction with South Fork of Kern River; fall, 3,200 feet; principal tributary, Canebrake Creek; intermittent in lower part of course. Kernville sheet.

China Creek (L); Madera County; rises in the southwestern part of T. 7 S., R. 22 E., Mount Diablo base and meridian, at altitude 3,500 feet above sea level; flows, in general, northwestward 5 miles to its junction with Fresno River (tributary to San Joaquin River) at Fresno Flats; fall, 1,300 feet. Mariposa sheet.

Chiquito Creek (R); Madera County; rises in the southeastern part of T. 4 S., R. 23 E., in a small lake on the western slope of Redtop Mountain, at altitude 8,650 feet; flows southwestward 1½ miles to Chiquito Lake, then, in general, southeastward 17 miles to its junction with the San Joaquin, in the northern part of T. 7 S., R. 24 E; fall, 5,650 feet; principal tributaries, Mugler, Beasore, and West Fork; the basin is about 14 miles long, 10 miles in maximum width, and includes a number of high meadows. Kaiser and Mount Lyell sheets.

Chiquito Creek, West Fork (R); Madera County; rises in the northern part of T. 6 S., R. 23 E., at altitude 6,900 feet above sea level; flows southeastward 7½ miles, then northeastward 1 mile to its junction with Chiquito Creek (tributary to San Joaquin River) in the southern part of T. 6 S., R. 24 E.; fall, 3,100 feet; many small, unnamed tributaries, draining the southeastern slope of Chiquito Ridge. Kaiser sheet.

Chiquito Lake; Madera County; northern part of T. 5 S., R. 23 E.; inlet and outlet, Chiquito Creek (tributary to San Joaquin River) altitude 7,923 feet. Mount Lyell sheet.

Chowchilla River (R); rises in Madera County, where it is formed by the junction of the East and West forks in T. 7 S., R. 20 E., Mount Diablo base and meridian; the East Fork rises on the south slope of the Chowchilla Mountains in T. 5 S., R. 21 E., at altitude 6,000 feet above sea level and flows southwestward; the West Fork rises in the southern part of T. 4 S., R. 19 E., at altitude 4,200 feet above sea level, and flows, in general, southeastward; the forks unite in Bailey Flats in Madera County, whence their combined waters flow southwestward to the lower San Joaquin; principal tributaries below the forks, Split Rock, and Chapman Creeks from the north. and

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Willow Creek from the south. The stream is characterized by sudden, short freshets and its lower bed is dry from June until the fall rains. Gaging station at base of foothills (1878–1884). Mariposa sheet; Bull. U. S. Geol. Survey No. 140, 1896, p. 295.

Chowchilla River, East and West forks. *See* Chowchilla River.

Chowchilla River, Middle Fork (L); rises in the southwestern part of T. 5 S., R. 20 E., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows west of south 8 miles to its junction with the West Fork of Chowchilla River (tributary through Chowchilla River to the San Joaquin); fall about 2,000 feet. Mariposa sheet.

Cinnamon Creek (R); Tulare County; Sequoia National Forest; rises in the southern part of T. 17 S., R. 29 E., Mount Diablo base and meridian, on the south slope of Case Mountain, at altitude 5,700 feet above sea level; flows southwestward 4½ miles into South Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 4,200 feet; intermittent. Kaweah sheet.

Clark Canyon Creek (L); Mariposa County; Yosemite National Park, rises on the north slope of Mount Clark (altitude 11,506 feet); flows northward 3 miles into Merced River (tributary to San Joaquin River) one-third mile below the mouth of Echo Creek; fall, 3,400 feet. Yosemite National Park map.

Clark Creek (R); Eldorado County; rises in the northern part of T. 8 N., R. 9 E., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows irregularly southward into Cosumnes River (tributary through Mokelumne River to the San Joaquin); fall, 700 feet. Placerville sheet.

Clark Fork (R); Mariposa County; Yosemite National Park; rises on the western slope of Mount Clark (altitude 11,506 feet); flows southwestward 4 miles to its junction with Ottoway Creek, 1 mile above the point at which the latter joins Illilouette Creek (tributary through Merced River to San Joaquin River); fall, 2,800 feet. Yosemite National Park map.

Clark Fork, Stanislaus River. *See* Stanislaus River, Clark Fork.

Clavey River (R); Tuolumne County; Stanislaus National Forest; rises 3 miles southwest of the southwest corner of T. 5 N., R. 20 E., at altitude 8,800 feet above sea level; flows southwestward 17 miles, southward 11 miles, then westward 3 miles into Tuolumne River (tributary to San Joaquin River); fall, 7,200 feet; principal tributaries, Lily, Trout, Twomile, Hull, and Reed Creeks; the lower course of the river is through a deep canyon. Gaging station near Tuolumne (1910–1912). Dardanelles (on which it is called Middle Fork of Tuolumne River), Big Trees, and Sonora sheets.

Clear Creek (L); Eldorado County; rises in the southeastern part of T. 9 N., R. 13 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; flows irregularly westward 5 miles into Steeley Fork of North Fork of Cosumnes River (tributary through Cosumnes River to the Mokelumne and thus to the San Joaquin); fall, 1,300 feet. Pyramid Peak and Placerville sheets.

Clear Creek (R); Eldorado County; rises in the northeastern part of T. 10 N., R. 12 E., Mount Diablo base and meridian, at altitude 3,800 feet above sea level; flows southwestward 7 miles into North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 2,100 feet. Placerville sheet.

Clear Creek (R); Tulare County; Sequoia National Park; rises in the north central part of T. 18 S., R. 30 E., Mount Diablo base and meridian, on the south slope of Homers Nose, at altitude 7,000 feet above sea level; flows west of south 2 miles into South Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 2,800 feet; intermittent. Kaweah sheet.

Clicks Creek (R) Tulare County; Sequoia National Forest; rises in the eastern part of T. 20 S., R. 31 E , Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows northeastward 5 miles into Little Kern River (tributary to Kern River) at Burnt Corral Meadows; fall, 2,000 feet. Kaweah sheet.

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Cliff Creek (L); Tulare County; Sequoia National Forest; rises in the northwestern part of T. 17 S., R. 32 E., in a small lake on the western slope of the Great Western Divide, at altitude 10,000 feet above sea level; flows northwestward 8 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 4,700 feet; principal tributary, Deer Creek. Several lakes south of the lake from which Cliff Creek flows are mapped as without outlet. Tehipite and Kaweah sheets.

Clover Creek (R); Tulare County; Sequoia National Park; formed in the northwestern part of T. 15 S., R. 30 E., Mount Diablo base and meridian, by the junction of its east and west forks; short streams draining the southern slopes of Kettle Peak; flows southward into Marble Fork of Kaweah River (tributary through Middle Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); length to head of West Fork 5 miles; fall, 2,400 feet. Tehipite sheet.

Coarse Gold Creek (L); Madera County; rises in the central part of T. 7 S., R. 21 E., Mount Diablo base and meridian, on the south slope of Deadwood Peak, at altitude 4,000 feet above sea level; flows very irregularly southwestward about 10 miles, then, in general, somewhat north of west 6 miles to its junction with Fresno River (tributary to San Joaquin River); fall, 2,200 feet; intermittent. Mariposa sheet.

Cobbs Creek (R); Tuolumne County; rises in the southwestern part of T. 1 S., R. 16 E., Mount Diablo base and meridian, near Bigoak Flat, at altitude 3,300 feet; flows southward into Moccasin Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,300 feet; intermittent. Sonora sheet.

Coffeepot Canyon Creek (L); Tulare County; Sequoia National Park; rises in the northwestern part of T. 18 S., R. 30 E., Mount Diablo base and meridian, on the north slope of Homers Nose, at altitude 7,000 feet above sea level; flows northwestward 2½ miles into East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,200 feet; intermittent. Kaweah sheet.

Cold Canyon Creek (L); Eldorado County; rises in the northeastern part of T. 8 N., R. 12 E., Mount Diablo base and meridian, at altitude 3,100 feet above sea level; flows southwestward 1½ miles, then northwestward 1 mile into Cedar Creek (tributary through South Fork of Cosumnes River to the Middle Fork of Cosumnes River and thus through Cosumnes River and Mokelumne River to the San Joaquin); fall, 800 feet. Placerville sheet.

Cold Canyon Creek (R); Tuolumne County; Yosemite National Park, rises in the southwestern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, at altitude 9,350 feet above sea level; flows southwestward 5 miles into Conness Creek (tributary through Tuolumne River to San Joaquin River); fall, 1,800 feet; intermittent. Yosemite National Park map.

Cold Creek (R); Amador County; Stanislaus National Forest; rises in the southwestern part of T. 9 N., R. 17 E., Mount Diablo base and meridian; at altitude 8,700 feet above sea level; flows southwestward 9 miles into North Fork Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 3,200 feet. Pyramid Peak sheet.

Cold Creek (R); Fresno County; rises in the Sierra National Forest, on the southern slope of Silver Divide, near Silver Pass; flows southwestward 7 miles, then southeastward 3 miles to its junction with Mono Creek (tributary to South Fork San Joaquin River); a number of small branching tributaries. Mount Goddard sheet.

Columbine Lake; Tulare County; Sequoia National Forest; northwestern part of T. 17 S., R. 32 E., Mount Diablo base and meridian; outlet northward to a small lake one-half mile southeast of the lake from which Cliff Creek flows to the Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); altitude, 10,900 feet above sea level. Kaweah sheet.

Comb Creek (L); Fresno County; Sierra National Forest; rises on the western slope of Comb Spur, at altitude 10,500 feet above sea level; flows west and southwest

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to its junction with Lewis Creek (tributary to South Fork of Kings River and thus through Kings River to the San Joaquin); length, 4 miles; fall, 4,500 feet. Tehipite sheet.

Conness Creek (R); Tuolumne County; Yosemite National Park, rises in the southern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, northwest of Conness Mountain at altitude 11,300 feet above sea level; flows southwestward 7½ miles into Tuolumne River (tributary to San Joaquin River); fall, 3,000 feet; principal tributaries, Alkali and Cold Canyon creeks. Yosemite National Park map.

Converse Creek (L); Fresno County; Sequoia National Forest; rises in the western part of T. 13 S., R. 28 E., Mount Diablo base and meridian, 1 mile south of Converse basin at altitude 6,600 feet above sea level; flows, in general, northwestward 5 miles into Kings River (tributary to San Joaquin River); fall, 5,300 feet. Tehipite sheet.

Copper Creek (R); Fresno County; Sierra National Forest; rises in Grouse Lake on the southwestern slope of Goat Mountain, at altitude 10,550 feet above sea level; flows southward 5 miles into South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,500 feet. Tehipite sheet.

Cora Lakes; Madera County; southern part of the Sierra National Forest, in Detachment Meadow; outlet, a stream 2½ miles long flowing south of east into North Fork San Joaquin River; three small lakes connected by short channels; the uppermost lake is about 8,350 feet above sea level; the lowest is 8,300 feet; fall of outlet, 1,900 feet. Mount Lyell sheet.

Corral Creek (R); Tuolumne County; Stanislaus National Forest; rises in the central part of T. 1 N., R. 18 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; flows, in general, somewhat east of south 6 miles to its junction with Tuolumne River (tributary to San Joaquin River); fall, 2,500 feet, of which 900 feet occurs in the last half mile; intermittent. Gaging station near Groveland (1910–1912). Sonora sheet.

Corral Hollow Creek (L); Alameda and San Joaquin Counties; rises in the northeastern part of T. 5 S., R. 4 E.; flows westward 3 miles, northwestward 7 miles, then east and northeast 11 miles to San Joaquin Valley south of Tracy; intermittent. Punnett's map of Sacramento and San Joaquin Counties. Called Buenos Ayres Creek on Land Office map, 1907.

Cosgrove Creek (R); Calaveras County; rises in the southern part of T. 5 N., R. 11 E., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows, in general, southwestward 9 miles to its junction with Calaveras River (tributary to San Joaquin River); fall, 650 feet. Jackson sheet.

Cosumnes River (R); Eldorado County; formed near Nashville in the northern part of T. 6 N., R. 10 E., Mount Diablo base and meridian, by the junction of its North and Middle forks. The North Fork, which drains the larger area and is, therefore, considered the continuation of the main stream, rises in the western part of T. 9 N., R. 16 E., on the north slope of Alder Hill (altitude 7,785 feet), and flows very irregularly westward to the southeastern part of T. 9 N., R. 10 E., where it turns abruptly and flows almost directly south to its junction with the Middle Fork in the northeastern part of T. 8 N., R. 10 E.; the Middle Fork receives the South Fork about 2 miles above its junction with the North Fork; below the forks the Cosumnes flows southwestward to its junction with Mokelumne River about 6 miles east of Walnut Grove.

The basin drained by the Cosumnes lies on the western slope of the Sierra, but it does not reach the crest of the Sierra like the basins of the Mokelumne on the south and the American on the north, between which it is wedged. Its total area above the valley rim is about 580 square miles. It is characterized by many low hills, separated by small, irregular valleys. The streams flow in somewhat parallel and regular, shallow canyons, separated by prominent ridges. Altitudes range from 200 feet in the foothills to 7,700 feet in the eastern border.

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The mean annual precipitation ranges from 20 inches in the valley to 35 or 40 inches at the upper elevations; the snowfall in the area is comparatively light and the snow soon disappears. The vegetation consists of grass, brush, and scraggy, scrubby timber in the lower foothills and good timber in the middle and upper areas. A small part of the upper basin is included in a national forest.

Little irrigation, if any, is practiced in this area; the minimum flow of the stream is so small that little power could be developed without storage.

Gaging station below Michigan Bar (1878–1884); at Michigan Bar (1907–1911).

Pyramid Peak, Placerville, and Lodi sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 219–220.

Cosumnes River, Middle Fork (L); Eldorado County; rises in the western part of T. 9 N., R. 16 E., Mount Diablo base and meridian, on the south slope of Alder Hill (altitude 7,785 feet); flows southwestward 8 miles, westward 7 miles, northwestward 11 miles, then southwestward 10 miles to the northeastern part of T. 8 N., R. 10 E., where it unites with the North Fork of Cosumnes to form Cosumnes River (tributary through Mokelumne River to the San Joaquin); fall, 6,200 feet; principal tributaries, North Fork of Middle Fork of Cosumnes and South Fork of Cosumnes rivers; basin long and narrow. Pyramid Peak and Placerville sheets.

Cosumnes River, Middle Fork, North Fork of (R); rises in the eastern part of T. 9 N., R. 14 E., Mount Diablo base and meridian, at altitude 5,900 feet above sea level; flows, in general, south of west 10 miles into Middle Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 3,000 feet. Pyramid Peak and Placerville sheets.

Cosumnes River, South Fork (L); Eldorado County; rises in the western part of T. 8 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,300 feet above sea level; flows westward 10 miles, then, in general, somewhat north of west 8 miles to its junction with the Middle Fork of Cosumnes (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 3,400 feet; principal tributaries, Scott, Indian, On It, and Cedar Creeks and South Fork of South Fork of Cosumnes River. Pyramid Peak and Placerville sheets.

Cosumnes River, South Fork, South Fork of (L); Eldorado County; rises in the western part of T. 8 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,300 feet above sea level; flows southwest, west, and northwest to its junction with the South Fork of Cosumnes River (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); length, 16 miles; fall, 2,400 feet. Pyramid Peak and Placerville sheets.

Cotton Creek (L); Mariposa County; rises in the southern part of T. 4 S., R. 16 E., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows westward 5 miles into Merced River (tributary to San Joaquin River); fall, 1,100 feet. Sonora sheet.

Cottonwood Creek (R); Madera County; rises in the southern part of T. 9 S., R. 20 E., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows southeastward 9 miles to its junction with San Joaquin River, in the northwestern part of T. 11 S., R. 21 E.; fall, 800 feet. Mariposa sheet.

Cottonwood Creek (R); Madera County; rises in the southern part of T. 9 S., R. 20 E., Mount Diablo base and meridian; flows southwestward into San Joaquin Valley; derives its water from seepage from irrigation above; carries water to the San Joaquin only at flood stages, at which times it carries also overflow from Fresno River which reaches it from a sloughlike channel; at ordinary stages the channel is dry and "creek" is a misnomer. Manuscript map of San Joaquin Valley (Fisk and Johnson).

Cottonwood Creek (R); Madera County; rises in the eastern part of T. 8 S., R. 19 E., Mount Diablo base and meridian, at altitude 1,300 feet above sea level;

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flows west of south 10 miles to its junction with Fresno River (tributary to San Joaquin River); fall, 800 feet. Mariposa sheet.

Cottonwood Creek (R); Tuolumne County; Yosemite National Park; rises in the eastern part of T. 1 N., R. 20 E., Mount Diablo base and meridian, in Smith Meadow south of Smith Peak (altitude 7,835 feet); flows westward 2 miles, then southwestward 3 miles into Middle Fork of Tuolumne River (tributary through South Fork to Tuolumne River and thus to the San Joaquin); fall, 900 feet. Yosemite National Park map.

Cow Creek (L); Tulare County; Sequoia National Park; rises in the western part of T. 15 S., R. 29 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; flows southward 1 mile, then southwestward 1½ miles into North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 2,200 feet. Tehipite sheet.

Cow Creek (R); Tulare County; Sequoia National Park; rises in the northern part of T. 18 S., R. 31 E., Mount Diablo base and meridian, at altitude 10,500 feet above sea level; flows westward 4 miles into Horse Creek (tributary through East Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 2,800 feet. Kaweah sheet.

Cow Creek (L); Tuolumne County; Stanislaus National Forest; rises 4 miles northeast of Parsons, at altitude 7,100 feet above sea level; flows south of west 5 miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 3,200 feet, of which 1,100 feet is made in the last half mile. Dardanelles and Big Trees sheets.

Cowell Creek (L); Kern County; Sierra National Forest; rises in the northern part of T. 25 S., R. 34 E., Mount Diablo base and meridian, at altitude 7,100 feet above sea level; flows, in general, southwestward 7 miles into Kern River, which it enters about 2 miles above Kernville; fall, 4,350 feet. Kernville sheet.

Coy Creek (L); Tulare County; Sequoia National Forest; rises in the east-central part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 7,000 feet above sea level; flows northwestward 2½ miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule River to Tule River and thus to the Tulare Lake basin); fall, 2,800 feet. Kaweah sheet.

Coyote Creek (R); Calaveras County; rises in the southeastern part of T. 4 N., R. 14 E., Mount Diablo base and meridian, 3 miles north of east from Murphy, at altitude 2,700 feet above sea level; flows, in general, southwestward 12 miles to its junction with Stanislaus River at Melones; fall, 1,900 feet. Big Trees sheet.

Coyote Creek (R); Tulare County; Sequoia National Forest; rises in the east-central part of T. 18 S., R. 32 E., Mount Diablo base and meridian, on the eastern slope of the Great Western Divide, in a small lake, at altitude 10,900 feet above sea level; flows southeastward 1 mile, then eastward 4 miles into Kern River, 2 miles above Kern Lake; fall, 4,000 feet. Olancha sheet.

Coyote Lake; Fresno County; in the northeastern part of T. 9 S., R. 26 E.; three inflowing streams; outlet, a stream 3 miles long, flowing northward to Big Creek (tributary to San Joaquin River); altitude, 8,950 feet; fall of outlet, 750 feet. Kaiser sheet.

Crabtree Creek (L); Tulare County; Sequoia National Forest; rises in a small lake in a glacial cirque, southwest of Whitney Pass, at altitude 12,550 feet above sea level; flows south of west 2 miles, then northwest 2½ miles into Whitney Creek (tributary to Kern River Pass through several small lakes); fall, 2,200 feet. Mount Whitney sheet.

Crane Creek (R); Mariposa County; Yosemite National Park, rises in the central part of T. 2 S., R. 20 E., at altitude 6,700 feet; flows irregularly southward 6½ miles to its junction with Merced River (tributary to San Joaquin River) at El Portal; fall, 4,700 feet; principal tributary, Little Crane Creek. Yosemite National Park map.

Crane Creek, Little (R); Mariposa County; rises in the western part of T. 2 S., R. 20 E., at altitude 6,400 feet; flows southeastward 4 miles to its junction with Crane

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Creek (tributary through Merced River to San Joaquin River) near McCauley; fall, 3,400 feet. Yosemite National Park map.

Crane Creek, North (L); Tuolumne County; Yosemite National Park; rises in the western part of T. 2 S., R. 20 E., Mount Diablo base and meridian, near Crane Flat in the Tuolumne grove of big trees, at altitude 6,300 feet above sea level; flows northwestward 4 miles into South Fork Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 1,800 feet. Yosemite National Park map.

Crater Creek (L); Madera County; rises in the eastern part of the Sierra National Forest, on the western slope of Mammoth Crest, at altitude 9,600 feet above sea level; flows southwestward 4 miles to junction with Middle Fork of San Joaquin River; fall, 3,600 feet; tributaries, small and unnamed; between Crater Creek and the San Joaquin south of Rainbow Falls is a small unnamed lake with one inlet and no outlet. Mount Lyell sheet.

Crazy Mule Gulch Creek (R); Tuolumne County; Yosemite National Park, rises in the southern part of T. 3 N., R. 23 E., Mount Diablo base and meridian, on the south slope of Suicide Ridge at altitude 10,000 feet above sea level; flows southwestward 2 miles into Piute Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,600 feet; principal tributary Rock Canyon Creek from Rock Island Lake. Yosemite National Park map.

Crescent Lake; Madera County; Yosemite National Park; eastern part of T. 4 S., R. 22 E., 1 mile west of Johnson Lake; outlet, a stream 2 miles long flowing southward to South Fork of Merced River (tributary through Merced River to the San Joaquin); altitude, 8,550 feet; fall of outlet, 2,800 feet. Yosemite National Park map.

Crevis Creek (L); Sacramento County; rises in the eastern part of T. 8 N., R. 8 E., Mount Diablo base and meridian, at altitude 400 feet above sea level; flows southwestward 6 miles into Deer Creek (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 250 feet. Sacramento sheet.

Crook Creek (R); Mariposa and Madera counties; rises in the northeastern part of T. 6 S., R. 20 E., on the south slope of Miami Mountain, at altitude 3,500 feet above sea level; flows southward about 4 miles to its junction with Fresno River (tributary to San Joaquin River) near Windy Gap; fall 1,500 feet. Mariposa sheet.

Cross Creek (L); Tulare County; rises in the northern part of T. 14 S., R. 32 E., on the southeast slope of Cross Mountain; flows northeastward 2½ miles into Bubbs Creek (tributary to South Fork of Kings River); fall, 3,900 feet. Mount Whitney sheet.

Crow Creek (L); Stanislaus County; rises in the northern part of T. 7 S., R. 6 E.; flows, in general, north of east into San Joaquin Valley; carries water only during the rainy season; sinks below the foothills. Orestimba-Panoche-Cantua special map.

Crown Creek (R); Fresno County; Sierra National Forest; rises in the eastern part of T. 10 S., R. 29 E., Mount Diablo base and meridian, in a group of glacial lakelets on the west slope of Kettle Ridge (altitude 11,490 feet); flows, in general, southwestward 8½ miles, then southeastward 2 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin, which it enters near the center of Tehipite Valley); tributaries, numerous, but only two—Scepter and Rodgers creeks—are named on the map; fall, 6,500 feet, of which 1,700 feet is made in the last mile. Mount Goddard and Tehipite sheets.

Crystal Creek (L); Fresno County; Sierra National Forest; rises in the northwestern part of T. 12 S., R. 30 E., Mount Diablo base and meridian, at altitude 9,000 feet above sea level; flows northwestward 2 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin), at the upper end of Tehipite Valley; fall, 4,500 feet. Tehipite sheet.

Crystal Lake; Tulare County; Sequoia National Forest; eastern part of T. 17 S., R. 31 E., Mount Diablo base and meridian, 2 miles north of the head of East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); no outlet mapped. Kaweah sheet.

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Cuddy Canyon Creek (R); Kern County; rises in the northern part of T. 8 N., R. 20 W., at altitude 7,000 feet above sea level; flows northwestward 3 miles, then eastward 9 miles to Castac Lake at the head of Grapevine Creek (tributary to San Joaquin Valley); carries little water during the summer season; flood discharge may amount to 30 second-feet. The stream sinks into the sands about 5 miles southwest of Castac Lake; a well-marked drainage line extends to the lake, but the stream has seldom, even in flood, been seen to flow into the lake. The waters of the stream are fresh and sweet; those of the lake are salty. Mount Pinos and Tejon sheets.

Curtis Creek (L); Tuolumne County; rises in the western part of T. 2 N., R. 16 E., Mount Diablo base and meridian, 2 miles northeast of Soulsbyville, 3,300 feet above sea level; flows southwest 12 miles into Sullivan Creek (tributary through Woods Creek to the Tuolumne and thus to the San Joaquin); fall, 1,900 feet. Sonora sheet.

Dalton Creek (R); Fresno County; rises in the southwestern part of T. 7 S., R. 25 E., Mount Diablo base and meridian, at the west end of Kaiser Crest, at altitude 8,300 feet above sea level; flows northwestward 4 miles, then southwestward 1 mile into San Joaquin River, in the east-central part of T. 7 S., R. 24 E., 1 mile below the mouth of Chiquito Creek; fall, 5,400 feet. Kaiser sheet.

Dana Fork, Tuolumne River. *See* Tuolumne River, Dana Fork.

Dardanelles Creek (R); Alpine and Tuolumne counties; Stanislaus National Forest; rises in Alpine County on the northwestern slope of the Dardanelles, at altitude 7,100 feet above sea level; flows southwestward 1½ miles, then somewhat east of south 2½ miles into Middle Fork Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 1,850 feet, of which 850 feet occurs in last 6½ miles just above the mouth. Dardanelles sheet.

Dead Man Creek (R); Alpine and Tuolumne counties; rises in the southeastern part of T. 6 N., R. 21 E., Mount Diablo base and meridian, on the north side of Sonora Pass at altitude 9,600 feet above sea level; flows northwestward 1 mile, southwestward 2 miles, then takes a general westerly course to the northern part of T. 5 N., R. 20 E., where it unites with Relief Creek to form the Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 3,300 feet; for about 5 miles forms the boundary between Alpine and Tuolumne counties. Dardanelles sheet.

Deadman Creek (L); Tulare County; Sequoia National Forest; rises in the northwestern part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 6,200 feet above sea level; flows northeastward 3 miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule to Tule River and thus to Tulare Lake basin); fall, 2,400 feet. Kaweah sheet.

Dead Man Fork (R); Amador County; rises in the southern part of T. 8 N., R. 12 E., Mount Diablo base and meridian, at altitude 2,600 feet above sea level; flows southwestward 5 miles into Dry Creek (tributary through Mokelumne River to the San Joaquin). Jackson sheet.

Deadmans Creek (L); Mariposa and Merced counties; rises in the northwestern part of T. 8 S., R. 17 E.; flows southwest and then west into San Joaquin Valley; carries no water after the rainy season; at flood stages is connected with Mariposa Creek by several interlacing channels. Fisk and Johnson map.

Deadwood Gulch Creek (R); Madera County; rises in the western part of T. 7 S., R. 21 E., Mount Diablo base and meridian, west of Deadwood Peak, at altitude 3,700 feet above sea level; flows southward 3 miles into Coarse Gold Creek (tributary through Fresno River to San Joaquin River); fall, 1,500 feet. Mariposa sheet.

Deep Canyon Creek (L); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 2 N., R. 22 E., Mount Diablo base and meridian, at altitude 8,900 feet above sea level; flows southwestward 4½ miles into Rancheria Creek (tributary through Tuolumne River to the San Joaquin); fall, 2,700 feet; principal tributary, Breeze Creek. Yosemite National Park map.

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Deep Creek (L); Tulare County; Sequoia National Forest; rises in the eastern part of T. 19 S., R. 32 E., Mount Diablo base and meridian, on the western slope of the Great Western Divide, at altitude 7,500 feet above sea level; flows southward 4 miles into Little Kern River (tributary to Kern River); fall, 1,800 feet. Olancha sheet.

Deep Hollow Creek (L); rises in the western part of T. 8 S., R. 19 E., at altitude 1,200 feet above sea level; flows northeastward 2 miles into Willow Creek (tributary through Chowchilla River to the San Joaquin); fall, 400 feet. Mariposa sheet.

Deer Canyon Creek (R); Fresno County; Sierra National Forest; rises in the northeastern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, on the south slope of Spanish Peak, at altitude 7,700 feet above sea level; flows, in general, southeastward 4½ miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,400 feet, of which 1,300 feet is made in the last half mile. Tehipite sheet.

Deer Creek (L); rises near Groveland, in the western part of T. 1 S., R. 16 E., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows northeastward 1½ miles, then northwestward 3½ miles into Tuolumne River (tributary to San Joaquin River); fall, 1,800 feet Sonora sheet.

Deer Creek (R); Alpine County; rises in Blue Lakes, at altitude 8,000 feet above sea level; flows southeastward through Clover Valley, then southwestward through Deer Valley to its junction with North Fork Mokelumne River (tributary through Mokelumne River to the San Joaquin); length, 5 miles; fall, 1,200 feet. Markleeville sheet.

Deer Creek (R); Eldorado and Sacramento counties; rises in the southwestern part of T. 10 N., R. 9 E., Mount Diablo base and meridian, at altitude 1,300 feet above sea level; flows very irregularly southwestward to its junction with Cosumnes River (tributary through Mokelumne River to the San Joaquin); length, 30 miles; fall, 1,250 feet; many short branching tributaries, of which Marble, Carson, and Crevis are named on the maps; sloughlike in lower course. Placerville, Sacramento, and Lodi sheets.

Deer Creek (L); Fresno County; Sierra National Forest; rises in the northern part of T. 10 S., R. 27 E., Mount Diablo base and meridian, on the east slope of Nelson Mountain, at altitude 9,400 feet above sea level; takes a general southwesterly course to its junction with Dinkey Creek (tributary through North Fork of Kings River to Kings River and thus to the San Joaquin); principal tributary, East Fork. Kaiser sheet.

Deer Creek (L); Tulare County; Sequoia National Forest; rises in the northeastern part of T. 16 S., R. 31 E., Mount Diablo base and meridian, in a lakelet near the summit of the Great Western Divide, at altitude 10,700 feet above sea level; flows northwestward 3 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,800 feet. Tehipite sheet.

Deer Creek (L); Tulare County; Sequoia National Forest; rises in the northern part of T. 17 S., R. 31 E., Mount Diablo base and meridian, at altitude 8,600 feet above sea level; flows northwestward 2 miles into Cliff Creek (tributary through Middle Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 1,600 feet; intermittent. Kaweah sheet.

Deer Creek (R); Tulare County; rises in the northern part of T. 23 S., R. 31 E., Mount Diablo base and meridian, southeast of the Tule Indian Reservation; flows very irregularly westward into San Joaquin Valley; discharges flood waters into Tulare Lake basin; the summer flow of the creek does not reach the San Joaquin Valley lands; ordinarily the water sinks within 10 or 12 miles of the foothills; the entire low-water flow of the creek is held for irrigation. Gaging station at base of foothills (1878–1884), near Hot Springs (1910–1912). Land Office map of California, 1907.

Deer Creek (R); Tuolumne County; rises in the northeastern part of T. 3 N., R. 16 E., Mount Diablo base and meridian; at altitude 4,700 feet above sea level; flows south-

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westward 6 miles into South Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 2,400 feet. Big Trees sheet.

Deer Creek, East Fork; Fresno County; Sierra National Forest; rises in the south-central part of T. 10 S., R. 27 E., Mount Diablo base and meridian, at altitude 8,100 feet above sea level; flows southwestward 3 miles into Deer Creek (tributary to North Fork of Kings River and thus through Kings River to the San Joaquin). Kaiser sheet.

Delaney Creek (R); Tuolumne County; Yosemite National Park, rises in the eastern part of T. 1 N., R. 24 E., Mount Diablo base and meridian, at altitude 11,100 feet above sea level; flows southwestward 6 miles into Tuolumne River (tributary to San Joaquin River) in Tuolumne Meadows; fall, 2,500 feet. Yosemite National Park map.

De Long Creek (R); rises in the northwestern part of T. 5 S., R. 20 E., at altitude 3,400 feet above sea level; flows southeastward 6 miles into the East Fork of Chowchilla River (tributary through Chowchilla River to the San Joaquin); fall, about 1,400 feet; principal tributary Oliver Creek. Mariposa sheet.

Desolation Lake; Fresno County; Sierra National Forest, 2 miles west of Mount Humphreys, in the Humphrey Basin; inlets, several streams draining small lakes; outlet, a stream 2 miles long flowing southward to Piute Creek (tributary to South Fork of San Joaquin River); elevation 11,362 feet; fall of outlet, 662 feet; length, 1 mile; maximum width, one-half mile. Mount Goddard sheet.

Devil Gulch Creek (L); Mariposa County; Sierra National Forest, rises in the northeastern part of T. 5 S., R. 20 E., Mount Diablo base and meridian, on the south slope of Devil Peak (altitude 7,079 feet); flows northwestward 9 miles into South Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 5,000 feet. Yosemite sheet.

Devils Bath Tub (L); Fresno County; Sierra National Forest, south of Silver Divide; outlet, a stream 1 mile long flowing southward to Cold Creek, a branch of Mono Creek (tributary to South Fork of San Joaquin River); elevation, 9,172 feet; fall of outlet, about 1,000 feet. Mount Goddard sheet.

Devils Canyon Creek (L); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 18 S., R. 30 E., Mount Diablo base and meridian, on the western slope of Dennison Mountain, at altitude 7,500 feet above sea level; flows northwestward 4 miles into South Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 4,100 feet; intermittent. Kaweah sheet.

Dike Creek (L); Madera County; rises in the northern part of the Sierra National Forest on the southern slope of Ritter Mountain, at altitude 12,000 feet above sea level; flows southwestward 3½ miles into North Fork of San Joaquin River (tributary to Middle Fork of San Joaquin); fall, 4,000 feet. Mount Lyell sheet.

Dingley Creek (R); Tuolumne County; Yosemite National Park, rises in the central part of T. 1 N., R. 24 E., on the south slope of Ragged Peak at altitude 10,500 feet above sea level; flows southwestward 4 miles into Tuolumne River (tributary to San Joaquin River); fall, 2,100 feet; intermittent. Yosemite National Park map.

Dinkey Creek (R); Fresno County; Sierra National Forest; rises in the northwestern part of T. 9 S., R. 27 E., Mount Diablo base and meridian, in Dinkey Lake, at altitude 9,150 feet above sea level; flows southwestward 6 miles, southward 4 miles, then, in general, east of south 15 miles to its junction with North Fork of Kings River (tributary through Kings River to the San Joaquin); principal tributaries, West Fork, Rock, Bear, and Deer creeks. Gaging station near Ockenden (1910–1912). Kaiser sheet; Le Conte's map of portion of the Sierra Nevada, Kings-Kern sheet (March, 1903).

Dinkey Creek, West Fork (R); Fresno County; Sierra National Forest; rises in the central part of T. 9 S., R. 26 E., Mount Diablo base and meridian, at altitude 8,700 feet above sea level; flows, in general, west of south, 4 miles into Dinkey Creek (tributary to North Fork of Kings River and thus through Kings River to the San Joaquin); fall, 1,850 feet. Kaiser sheet.

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Dinkey Lake; Fresno County; Sierra National Forest; northwestern part of T. 9 S., R. 27 E., Mount Diablo base and meridian; two small inlets; outlet, Dinkey Creek to North Fork of Kings River (tributary through Kings River to the San Joaquin); altitude, 9,150 feet. Kaiser sheet.

Disappearing Creek (L); Fresno County; Sierra National Forest; rises in glacial lakelets, south of the Goddard Divide, at altitude 12,000 feet above sea level; flows southeastward 5 miles and southwestward 2 miles into Goddard Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); fall, 5,000 feet. Mount Goddard sheet.

Disaster Creek (R); Alpine County; Stanislaus National Forest; rises 1½ miles south of the south line of T. 8 N., R. 20 E., Mount Diablo base and meridian, 2½ miles southeast of Highland Lake, on the northwest slope of Arnot Peak (altitude, 10,036 feet); flows southwestward one-half mile, then east of south 4 miles into Clark Fork (tributary through Middle Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); fall, 3,000 feet. Dardanelles sheet.

Doe Lake; Tuolumne County; Yosemite National Park, northwestern part of T. 2 N., R. 23 E., Mount Diablo base and meridian; inlet, an intermittent stream flowing from Tallulah Lake; outlet. a stream half a mile long, flowing westward to Piute Creek (tributary through Tuolumne River to the San Joaquin); altitude, 9,250 feet; fall of outlet, 900 feet. Yosemite National Park map.

Dog Creek (R); Fresno County; Sierra National Forest; rises in the northern part of T. 11 S., R. 30 E., Mount Diablo base and meridian, on the south slope of Tunemah Peak at altitude 10,800 feet above sea level; flows southward 3 miles, passing through Bunch Grass Flat into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,700 feet, of which 3,000 feet is made in the last 1½ miles. Tehipite heet.

Dog Lake; Tuolumne County; Yosemite National Park, southern part of T. 1 N., R. 24 E., Mount Diablo base and meridian; outlet, a stream 1 mile long flowing southwestward to Tuolumne River (tributary to San Joaquin River) in Tuolumne Meadows; altitude, 9,240 feet; fall of outlet, 640 feet. Yosemite National Park map.

Dollar Lake; Tulare County, in the north-central part of T. 15 S., R. 31 E., 2 miles west of Glacier Ridge; one inlet, draining two small lakes; outlet, through Copper Canyon [1] to Roaring River (tributary to South Fork Kings River); altitude, 10,050 feet; very small. Tehipite sheet.

Dorothy Lake; Tuolumne County; Yosemite National Park, west-central part of T. 4 N., R. 22 E., Mount Diablo base and meridian; outlet, Falls Creek to Tuolumne River (tributary to San Joaquin River); altitude, 9,550 feet; length, three-fourths mile; maximum width, one-third mile. Yosemite National Park map.

Dorst Creek (L); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 14 S., R. 30 E., Mount Diablo base and meridian, in J. Q. Pass, at altitude 9,000 feet above sea level; flows, in general, southwestward 6 miles to the northwestern part of T. 15 S., R. 29 E., where it unites with Stony Creek to form the North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,300 feet. Tehipite sheet.

Dougherty Creek (L); Fresno County; Sierra National Forest, formed by the junction of East and Middle forks; East Fork, which drains the larger area and is considered the continuation of the main stream, rises 2 miles north of Goat Mountain, at altitude 10,600 feet above sea level; flows northward 2 miles, then westward 2 miles to the point at which it receives the Middle Fork; below the forks the creek flows west of north 3 miles to its junction with Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall from head of East Fork to Kings River, 4,600

[1] The eastern branch of this canyon is said to be incorrectly named on the Tehipite sheet. The name "Dead Man Canyon" is properly applied, as on Le Conte's map, to the western branch; the eastern branch is Copper Canyon. Bull. Sierra Club, vol. 6, No. 3, June, 1907, p. 158.

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feet; basin contains many small lakes, of which State Lakes, tributary to the East Fork, and Volcanic Lakes, at the head of the West Fork, are the most important. Tehipite sheet.

Dougherty Creek, Middle Fork (L); Fresno County; Sierra National Forest; rises on the west slope of Goat Crest, at altitude 11,200 feet above sea level; flows westward 1 mile, then northward 3 miles to its junction with East Fork, with which it forms Dougherty Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); fall above junction with East Fork, 3,000 feet. Tehipite sheet.

Dougherty Creek, West Fork (L); Fresno County; Sierra National Forest; rises in Volcanic Lakes on the east slope of Comb Spur at altitude 10,200 feet above sea level; flows east of north 2½ miles into Middle Fork of Dougherty Creek (tributary through Dougherty Creek to Middle Fork of Kings River and thus through Kings River to the San Joaquin); fall, above junction with Middle Fork, 2,200 feet. Tehipite sheet.

Dry Creek (R); Amador and Sacramento counties; rises in the northeastern part of T. 7 N., R. 12 E., Mount Diablo base and meridian, near Lockwood, at altitude 3,200 feet above sea level; takes a general southwesterly course to its junction with Mokelumne River (tributary to San Joaquin River); length, 50 miles; fall, 2,950 feet; crosses the valley in several interlocking channels, which are sloughlike as they approach the river; principal tributaries, Rancheria, Sutter, and Jackson creeks. Gaging station at base of foothills (1878–1884); near Ione (1911–12). Jackson and Lodi sheets.

Dry Creek (L); Fresno County; rises in the western part of T. 17 S., R. 13 W.; flows northeastward into San Joaquin Valley; length, 12 miles; carries water only during the rainy season. Land Office map of California, 1907.

Dry Creek (R); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 21 S., R. 32 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows southeastward 7½ miles into Kern River; fall, 4,000 feet. Kaweah and Kernville sheets.

Dry Creek (R); Tuolumne County; rises in the central part of T. 3 N., R. 16 E., Mount Diablo base and meridian, at altitude 3,600 feet above sea level; flows southwestward 1 mile into Deer Creek (tributary through South Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin). Big Trees sheet.

Dry Creek, Little (L); Fresno County; rises in the southern part of T. 10 S., R. 23 E., Mount Diablo base and meridian; flows southwestward 13 miles into San Joaquin River. Land Office map, 1907.

Dry Meadow Creek. *See* Meadow Creek, Dry.

Duck Creek (R); Alpine County; Stanislaus National Forest; rises in Duck Lake in the northern part of T. 7 N., R. 18 E., Mount Diablo base and meridian, at altitude 7,250 feet; flows eastward one-half mile, then southwestward 2½ miles into North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus River and thus to the San Joaquin); fall, 400 feet. Dardanelles and Tehipite sheets.

Duck Lake; Alpine County; Stanislaus National Forest, northern part of T. 7 N., R. 18 E., Mount Diablo base and meridian; outlet, Duck Creek to North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); altitude, 7,250 feet. Dardanelles sheet.

Dumbbell Lakes; Fresno County; Sierra National Forest; 2 miles north of Lake Basin; group of small connected lakes, discharging by a stream 3 miles long, flowing southwestward to Cartridge Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); Mount Goddard sheet.

Durrwood Creek (L); Tulare County, Kern National Forest; rises in the northeastern part of T. 22 S., R. 33 E., Mount Diablo base and meridian, at altitude 8,800 above sea level; flows, in general, northwestward 6 miles into Kern River; fall, 4,700 feet. Olancha sheet.

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Dusy Branch (L); Fresno County; Sierra National Forest; rises on the west slope of Mount Winchell (altitude 13,749 feet); flows south of west passing through several small lakes to its junction with Middle Fork of Kings River (tributary through Kings River to the San Joaquin); length, 4 miles; fall, 3,000 feet. Mount Goddard sheet.

Dutch Creek (R); Mariposa County; rises in the northwestern part of T. 3 S., R. 17 E., Mount Diablo base and meridian, at altitude 3,200 feet above sea level; flows northeastward 3 miles into Bean Creek (tributary through Smith Creek to North Fork of Merced River and thus through Merced River to the San Joaquin); fall, 500 feet; intermittent. Sonora sheet.

Dutch Lake; Fresno County; Sierra National Forest, 2 miles southwest of the southeast corner of T. 7 S., R. 27 E., Mount Diablo base and meridian; no inlet mapped; outlet, a stream flowing north 1 mile, then directly east 1 mile, into South Fork of San Joaquin River (head of San Joaquin); elevation, 9,150 feet; fall of outlet, 1,850 feet; very small. Mount Goddard sheet.

Eagle Creek (L); Tuolumne County; rises in the southern part of T. 5 N., R. 20 E., Mount Diablo base and meridian, 1½ miles east of East Flange Rock, at altitude 8,000 feet above sea level; flows northwestward 5 miles, then, in general, northward 3 miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin) at Brightman Flat; fall, 2,200 feet; principal tributary, a stream flowing northward along the east base of Eagle Peak and through Eagle Meadow. Dardanelles sheet.

Eagle Creek (R); Tuolumne County; rises in the northwestern part of T. 3 N., R. 16 E., Mount Diablo base and meridian; at altitude 3,200 feet above sea level; flows southwestward 5 miles into Rose Creek (tributary through Stanislaus River to the San Joaquin); fall, 1,300 feet. Big Trees sheet.

Eagle Lake; Tulare County; Sequoia National Forest; southern part of T. 17 S., R. 31 E., Mount Diablo base and meridian; outlet, an intermittent stream 1½ miles long, flowing northward to East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); altitude, 9,900 feet; fall of outlet, 2,000 feet. Kaweah sheet.

East Creek (L); Tulare County; rises in Sierra National Forest, on the north slope of the Kings-Kern Divide, at altitude 12,100 feet above sea level; flows northward, passing through Lake Reflection and East Lake, to its junction with Bubbs Creek (tributary to South Fork of Kings River) in the southeastern part of Fresno County; length, 6 miles; fall, 3,600 feet. Mount Whitney sheet.

East Fork or **Branch**. See name of main stream.

East Lake; Tulare County; Sierra National Forest; northeastern part of T. 14 S., R. 32 E., Mount Diablo base and meridian; inlets, Ousel Creek and East Creek; outlet, East Creek to Bubbs Creek (tributary to South Fork of Kings River); altitude, 9,609 feet; below Lake Reflection, 559 feet; fall of outlet, 1,200 feet. Mount Whitney sheet.

Echo Creek (R); Mariposa County; Yosemite National Park; rises on the north slope of Rafferty Peak (altitude, 11,178 feet); flows southwestward 7½ miles into Merced River (tributary to San Joaquin River) 1 mile below Merced Lake; fall, 3,400 feet. Yosemite National Park map.

Edith Lake; Tuolumne County; Yosemite National Park; northeastern part of T. 2 N., R. 20 E., Mount Diablo base and meridian; inlet, East Fork of Eleanor Creek; outlet, Eleanor Creek to Cherry Creek (tributary through Tuolumne River to the San Joaquin); altitude 6,603 feet; fall of Eleanor Creek in the 7 miles between Edith Lake and Lake Eleanor, 1,900 feet. Yosemite National Park map.

Edna Lake; Madera County; at north base of Merced and east base of Ottoway Peaks; outlet, Merced Peak Fork to Merced River (tributary to the San Joaquin); altitude, 10,500 feet. Mount Lyell sheet.

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Eldorado Creek (L); Mariposa County; rises in the southeastern part of T. 4 S., R. 16 E.; flows southwestward to Burns Creek. Sonora sheet; Land Office map of California, 1907.

Eleanor Creek (L); Tuolumne County, Yosemite National Park; formed in the western part of T. 2 N., R. 20 E., Mount Diablo base and meridian, by the junction of East and West forks; the East Fork, which drains the larger area and is here considered the continuation of the main stream, rises on the south slope of Bigelow Peak (altitude 10,510 feet), and the north slope of Kendrick Peak (altitude 10,346 feet), each of which sends a stream to upper Twin Lake; the East Fork flows southwestward 13 miles to its junction with the West Fork; below the forks Eleanor Creek continues its southwesterly course 5 miles, passing through Lake Eleanor then flows almost directly south 2½ miles, then southwestward again 1 mile to its junction with Cherry Creek; fall in the 9 miles below the forks, 1,500 feet; principal tributaries below the forks, Frog and Kibbie creeks, which enter Lake Eleanor, and McGill Creek, which comes in 3 miles below Lake Eleanor. The basin contains many glacial lakelets, some of which are mapped as without outlet. Gaging stations at Eleanor trail crossing (1901), below Eleanor Lake (1910–1912). Yosemite National Park map.

Eleanor Creek, East Fork. *See* Eleanor Creek.

Eleanor Creek, West Fork (R); Tuolumne County; Yosemite National Park; rises on the south slope of Bartlett Peak, at altitude 7,700 feet above sea level; flows, in general, southwestward about 5 miles to its junction with Eleanor Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); fall, 2,100 feet; intermittent in upper part. Yosemite National Park map.

Eleanor Lake; Tuolumne County; Yosemite National Park; southeastern part of T. 2 N., R. 19 E., Mount Diablo base and meridian; inlets, Frog and Kibbie creeks and Eleanor Creek, which flows through the lake to its junction with Cherry Creek (tributary through Tuolumne River to the San Joaquin); altitude, 4,694 feet; fall of Eleanor Creek in the 4 miles below Lake Eleanor, 550 feet; length, 1¼ miles; maximum width, three-fourths mile. Yosemite National Park map.

Elizabeth Lake; Tuolumne County; Yosemite National Park, central part of T. 1 S., R. 24 E., Mount Diablo base and meridian; outlet, Unicorn Creek to Tuolumne River (tributary to San Joaquin River); altitude, 9,550 feet. Yosemite National Park map.

El Paso Creek (R); Kern County; rises in the western part of T. 10 N., R. 16 W., San Bernardino base and meridian, on the northern slope of the Tehachapi Mountains, at altitude 6,000 feet above sea level; flows northwestward toward Buena Vista Lake Reservoir. Land Office map, 1907. Tejon sheet.

El Puerto Creek (L); Stanislaus County; rises in the northwestern part of T. 6 S., R. 6 E.; flows northeastward 7 miles; discharges into San Joaquin Valley; carries water only during the rainy season; tributary, Washington Gulch Creek. Orestimba-Panoche-Cantua special sheet.

Emeric Creek (R); Mariposa County; rises in the southern part of T. 1 S., R. 24 E., Mount Diablo base and meridian, at altitude 10,000 feet above sea level; flows southwestward 3 miles, passing through Emeric Lake to its junction with Fletcher Creek (tributary through McClure Fork to Merced River and thus to the San Joaquin); fall, 1,000 feet. Mount Lyell sheet.

Emeric Lake; Mariposa County; northwestern part of T. 2 S., R. 24 E., Mount Diablo base and meridian; inlet, Emeric Creek; outlet, Emeric Creek to Fletcher Creek (tributary through McClure Fork to Merced River and thus to the San Joaquin); altitude, 9,300 feet. Mount Lyell sheet.

Emigrant Lake; Tuolumne County; Stanislaus National Forest, southwestern part of T. 4 N., R. 21 E., Mount Diablo base and meridian; two inlets, the longer of which drains a number of small lakes in and above Emigrant Meadow; outlet, a

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stream 3 miles long flowing southwestward to the North Fork of Cherry Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); altitude, 8,708 feet; length, 2 miles; width, about one-fourth mile. Yosemite National Park map.

Erskine Creek (L); Kern County; Sierra National Forest; rises in the northeastern part of T. 28 S., R. 33 E., at altitude 6,000 feet above sea level; flows northwestward to its junction with Kern River, in Hot Spring Valley; length, 13 miles; fall, 3,600 feet. Gaging station near Isabella (1911-12). Kernville sheet.

Eshom Creek (R); Tulare County; Sequoia National Forest; rises in the north central part of T. 14 S., R. 28 E., Mount Diablo base and meridian, on the northwest slope of Redwood Mountain, at altitude 6,000 feet above sea level; flows, in general, west of south 6 miles, then southeastward 3 miles into North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,400 feet. Tehipite sheet.

Esperanza Creek (L); Calaveras County; rises in the northwestern part of T. 5 N., R. 14 E., Mount Diablo base and meridian, at altitude 3,300 feet above sea level; flows westward 9 miles, then northwestward 2 miles into North Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 1,000 feet. Big Trees and Jackson sheets.

Evelyn Lake; Tulare County; Sequoia National Park; northeastern part of T. 18 S., R. 30 E., Mount Diablo base and meridian; outlet, a stream 2½ miles long flowing, in general, northwestward into Horse Creek (tributary through East Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); altitude, 8,700 feet; fall of outlet, 3,400 feet. Kaweah sheet.

Evelyn Lake; Tuolumne County; Yosemite National Park; southeastern part of T. 1 S., R. 24 E., Mount Diablo base and meridian; one inlet; outlet, a stream 2 miles long flowing northward to Rafferty Creek (tributary through Lyell Fork of Tuolumne River to Tuolumne River and thus to the San Joaquin); altitude, 10,350 feet; fall of outlet, 1,650 feet. Yosemite National Park map.

Evolution Creek (R); Fresno County; rises in Sierra National Forest, in Wanda Lake, on the north slope of Goddard Divide, between Mount Huxley and Mount Goddard, at altitude 11,452 feet above sea level; flows northward to Evolution Lake, then northwestward 6 miles to its junction with the South Fork of San Joaquin River (head of San Joaquin); in the 2½ miles between Wanda Lake and Evolution Lake Evolution Creek falls 462 feet; in the 6 miles below Evolution Lake the fall is about 2,600 feet; this creek receives the drainage from numerous lakes lying high up on the slopes of Goddard and Glacier divides. Mount Goddard sheet.

Evolution Lake; Fresno County; Sierra National Forest, 1 mile west of Mount Darwin; elevation, 13,841 feet; inlet, Evolution Creek from Wanda Lake; outlet, Evolution Creek to South Fork of San Joaquin River (head of San Joaquin); elevation, 10,990 feet. Mount Goddard sheet.

Falls Creek (R); Tuolumne County; Yosemite National Park; rises in the west central part of T. 4 N., R. 22 E., Mount Diablo base and meridian, in Dorothy Lake, at altitude 9,550 feet above sea level; flows southwestward 20 miles to its junction with Tuolumne River (tributary to the San Joaquin), in Hetch Hetchy Valley; fall, 5,900 feet, of which 1,700 feet is made in about half a mile in entering Hetch Hetchy Valley; the drainage basin is long and narrow, the maximum width being about 5 miles at the upper end; lakes are numerous and some of them are of good size; the most important are Dorothy, Mary, Tilden, Wilmer, Branigan, and Vernon lakes. Yosemite National Park map.

Fanny Creek (L); Eldorado County; rises in the northern part of T. 8 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows, in general, northwestward 2 miles into Slate Creek (tributary through Big Canyon Creek to

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Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 900 feet. Placerville sheet.

Fay Creek (R); Tulare and Kern counties; Sierra National Forest; rises in the western part of T. 24 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,200 feet above sea level; flows somewhat east of south 12 miles; discharges into the valley of the South Fork of Kern River, 2 miles north of Weldon; sinks before reaching the river; fall, 5,200 feet. Kernville sheet.

Feliciana Creek (L); Mariposa County; Sierra National Forest; rises in the western part of T. 4 S., R. 19 E., Mount Diablo base and meridian, on the east slope of Feliciana Mountain, at altitude 3,700 feet above sea level; flows northwestward 3½ miles into Merced River (tributary to San Joaquin River); fall, 2,400 feet. Yosemite sheet.

Fine Gold Creek (R); Madera County; rises in the northeastern part of T. 8 S., R. 21 E., on the south slope of Thornberry Mountain, at altitude 4,000 feet above sea level; flows, in general, somewhat west of south, about 18 miles, to its junction with San Joaquin River, in the eastern part of T. 10 S., R. 21 E.; fall below the forks, 3,600 feet; principal tributaries, Little Fine Gold Creek and North Fork. Mariposa sheet.

Fine Gold Creek, Little (L); Madera County; rises in the southern part of T. 7 S., R. 22 E., on the western slope of Goat Mountain, at altitude 4,000 feet above sea level; flows southeastward 4 miles, southward 2 miles, then southwestward about 4 miles into Fine Gold Creek (tributary to San Joaquin River) at the junction of North Fork, near Mountain View School; fall 2,700 feet. Mariposa sheet.

Fine Gold Creek, North Fork (R); Madera County; rises in the northern part of T. 8 S., R. 21 E., west of Thornberry Mountain, at altitude 3,000 feet above sea level; flows, in general, southeastward 6 miles into Fine Gold Creek (tributary to San Joaquin River), near the junction with Little Fine Gold; fall 1,700 feet. Mariposa sheet.

Fish Creek (L); Fresno County; rises in the Sierra National Forest, in a group of small lakes, north of the Silver Divide, at altitude about 11,500 feet; flows in a general northwesterly course about 16 miles to its junction with Middle Fork of San Joaquin (tributary to South Fork San Joaquin, head of San Joaquin); fall, 6,200 feet; principal tributaries, Minnow and Silver creeks; many small lakes in the upper part of this basin. Mount Goddard, Kaiser, and Mount Lyell sheets.

Fish Creek (R); Madera County; rises in the northern part of T. 9 S., R. 22 E., at altitude 2,200 feet above sea level; flows, in general, southeastward 4 miles to its junction with San Joaquin River, in the eastern part of same township; fall, 1,300 feet. Mariposa sheet.

Fish Creek (R); Tulare County; Sierra National Forest; rises in the east-central part of T. 20 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,700 feet above sea level; flows, in general, southeastward to its junction with South Fork of Kern River (tributary to Kern River); length, 17 miles; fall, 3,000 feet; principal tributaries, Jackson and Mahogany creeks. Olancha and Kernville sheets.

Fish Creek (R); Tulare County; Sequoia National Forest; rises in the western part of T. 20 S., R. 32 E., Mount Diablo base and meridian, at altitude 7,700 feet above sea level; flows north of east 5 miles into Little Kern River (tributary to Kern River); fall, 1,900 feet. Kaweah and Olancha sheets.

Fisher Creek (L); Tuolumne County; rises in the east central part of T. 5 N., R. 17 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southwestward 3 miles, then north of west 3 miles into Skull Creek (tributary through Griswold Creek to North Fork of Stanislaus River and thus through Middle Fork of Stanislaus and Stanislaus River to the San Joaquin). Big Trees sheet.

Five Lakes; Tulare County; Sequoia National Forest; northwestern part of T. 17 S., R. 32 E., on the Great Western Divide; lakes are connected and discharge by a stream 1 mile long flowing northeastward into Big Arroyo. The highest of the lakes is 10,200 feet above sea level, the lowest is 9,800 feet; the lakes are all small, the largest being half a mile long. Kaweah sheet.

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Fivemile Creek (L); Tuolumne County; rises in the northern part of T. 2 N., R. 16 E., Mount Diablo base and meridian, 1 mile west of Mount Elizabeth, at altitude 3,800 feet above sea level; flows westward 5 miles into South Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 2,300 feet. Big Trees sheet.

Flat Creek (L); Eldorado County; rises in the northwestern part of T. 8 N., R. 12 E., Mount Diablo base and meridian, at altitude 2,800 feet above sea level; flows westward 3½ miles, then northwestward 1 mile into Spanish Creek (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 1,200 feet. Placerville sheet.

Flat Creek, Tulare County. *See* Deer Creek.

Fletcher Creek (R); Mariposa County; rises in the southern part of T. 1 S., R. 24 E., in Fletcher Lake (altitude 10,300 feet above sea level); flows southwestward 6 miles passing through Babcock Lake into McClure Fork (tributary through Merced River to the San Joaquin); fall, 2,300 feet; principal tributary, Emeric Creek. Mount Lyell sheet.

Fletcher Lake; Mariposa County; on line between Tps. 1 and 2 S., R. 24 E., 1½ miles northwest of Parsons Peak; two small inlets, one of which may be considered the head of Fletcher Creek; outlet, Fletcher Creek to McClure Fork (tributary through Merced River to the San Joaquin); altitude, 10,300 feet. Mount Lyell sheet.

Flora Lake; Tuolumne County; Yosemite National Park; northwestern part of T. 2 N., R. 20 E., Mount Diablo base and meridian; inlet, West Fork of Eleanor Creek; outlet, West Fork Eleanor Creek to Eleanor Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); altitude, 6,950 feet; fall of West Fork in the 3 miles below Flora Lake, 1,350 feet. Yosemite National Park map.

Florence Creek (L); Madera County; rises in the eastern part of T. 2 S., R. 24 E., north of Florence Mountain, at altitude 11,500 feet; flows westward 3 miles passing through several small lakes to its junction with McClure Fork (tributary through Merced River to the San Joaquin); in Mariposa County, in the central part of T. 2 S., R. 24 E.; fall, 2,300 feet. Mount Lyell sheet.

Florence Lake; Fresno County; Sierra National Forest; 2 miles southeast of the southeast corner of T 7 S., R. 27 E.; neither inlet nor outlet is shown on the map, but a pass is indicated opening westward to South Fork, San Joaquin River (head of San Joaquin); altitude, 7,300 feet above sea level; length and width, each about one-fourth mile; immediately north of this lake is a very small unnamed lake, mapped without outlet. Mount Goddard sheet.

Foerster Creek (R); Madera County; rises in the west slope of Foerster Peak, altitude 12,060 feet; flows westward 2 miles into Triple Peak Fork, Merced River (tributary through Merced River to the San Joaquin); fall, 2,600 feet, of which 700 feet occurs in the last one-fourth mile; tributary from Harriet Lake. Mount Lyell sheet.

Fortymile Creek (L); Eldorado County; rises in the northwestern part of T. 9 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows southwestward 2½ miles into French Creek (tributary through Big Canyon Creek to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 500 feet. Placerville sheet.

Four Forks Creek (R); Fresno County; rises in Sierra National Forest, on the west slope of Saddle Mountain (altitude 11,200 feet); flows southwestward 5 miles into South Fork of San Joaquin River (head of San Joaquin); principal tributary, Rock Creek; fall, 4,000 feet. Kaiser sheet.

Freeman Creek (R); Tulare County; Sequoia National Forest; rises in the south western part of T. 20 S., R. 32 E., Mount Diablo base and meridian, at altitude 7,000 feet above sea level; flows north of east 3 miles, then southeastward 3½ miles into Kern River; fall, 2,800 feet. Kaweah and Olancha sheets.

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French Creek (R); Eldorado County; rises in the northwestern part of T. 9 N., R. 10 E., Mount Diablo base and meridian, at Shingle Springs, at altitude 1,450 feet above sea level; flows irregularly southward 6 miles into Big Canyon Creek (tributary to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 650 feet; principal tributary, Shingle Creek. Placerville sheet.

French Camp Creek (R); Stanislaus and San Joaquin counties; rises in the northwestern part of T. 1 S., R. 11 E., Mount Diablo base and meridian, near Knights Ferry; flows northwestward into San Joaquin Valley discharging its flood waters through several distributary channels; fed by seepage from irrigation above Knights Ferry; principal tributary, Rock Creek. Land Office map of California, 1907.

French Canyon Creek (R); Fresno County; rises in the Sierra National Forest, in a lake one-half mile northwest of Four Gables, at altitude 11,254 feet; flows southwestward 5 miles to junction with Piute Creek (tributary to South Fork San Joaquin River); fall, 1,700 feet; basin contains many glacial lakes, more than 40 being shown on the map. The largest of these lakes is nearly a mile long and possibly one-fourth mile wide. Mount Goddard sheet.

French Gulch Creek (L); Calaveras County; rises in the northeastern part of T. 3 N., R. 13 E., Mount Diablo base and meridian, at altitude 2,300 feet above sea level; flows southwestward 2 miles, then northwestward 3 miles into San Domingo Creek (tributary through South Fork of Calaveras to Calaveras River and thus to the San Joaquin); fall, 700 feet. Jackson sheet.

Fresno River (R); Madera County; formed in the southeastern part of T. 6 S., R. 21 E., Mount Diablo base and meridian, by the union of Nelder Creek and Lewis Fork; flows, in general, southwestward to its junction with the San Joaquin. Lewis Fork, the headwater stream draining the larger area, rises in the southeastern part of T. 5 S., R. 21 E., at altitude about 5,000 feet above sea level; flows southward about 8 miles to its junction with Nelder Creek; fall above the junction, about 2,000 feet.

The Fresno may be classed between streams that flow from the high mountains covered with perpetual snow and those of the foothills whose periods of flood depend on rain alone. The area of the basin is 272 square miles. At a point about 2 miles above Madera the channel usually dries up in June and remains dry until the fall rains. Between this point and the place where the river leaves bedrock in the canyon, there is about 10 miles of sandy bed.

A canal, well up in the mountains, takes water from Big Creek, one of the tributaries of Merced River, and another canal takes water from the North Fork of the San Joaquin; both canals discharge continuously into Fresno River, the flow of which is, of course, increased to the extent of the delivery by the canals.

The water of the river is utilized for irrigation, chiefly of areas in fruits and vines.

Gaging stations at base of foothills (1878–1884), near Knowles (1911–12). Mariposa sheet. See also Bull. U. S. Geol. Survey No. 140, 1896, pp. 294–295.

Fresno River, Lewis Fork. *See* Lewis Fork.

Fresno River, North Fork (R); Mariposa County; rises in the central part of T. 5 S., R. 21 E., Mount Diablo base and meridian, on the south slope of Hogan Mountain, at altitude 5,800 feet above sea level; flows somewhat east of south 6 miles, then southwestward 6 miles to its junction with Fresno River (tributary to San Joaquin River) near Wassamma; fall, 2,500 feet; principal tributary, Peterson Creek; gaging station near Sugar pine (1910–12). Mariposa sheet.

Frog Creek (R); Kern County; Sierra National Forest; rises in the western part of T. 28 S., R. 36 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows westward 4 miles into Kelso Creek (tributary to South Fork of Kern River); fall, 1,100 feet; intermittent. Kernville sheet.

Frog Creek (L); Tuolumne County; Yosemite National Park; rises on the south slope of Schofield Peak (altitude, 9,913 feet) and the east slope of Richardson Peak

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(altitude, 9,845 feet); flows southwestward 13 miles into Lake Eleanor on Eleanor Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); fall, 4,100 feet; basin is very narrow and tributaries are few and unimportant; of the lakes only two are named on the map, Bearup and Laurel. Yosemite National Park map.

Funston Creek (R); Tulare County; Sequoia National Forest; rises in the northeastern part of T. 17 S., R. 32 E., Mount Diablo base and meridian, in Moraine Lake, at altitude 9,440 feet above sea level; flows eastward 2 miles, then southeastward one-half mile into Kern River near Funston Camp; fall, 2,700 feet; principal tributary, Chagoopa Creek; intermittent. Olancha sheet.

Gardner Creek (L); Fresno County; rises in Sierra National Forest, in a lake on the northeastern slope of Mount Gardner (altitude 12,903 feet); flows northwestward 2½ miles, then south of west 4 miles into South Fork of Kings River (tributary to San Joaquin River) at Mist Falls; fall, 5,600 feet; basin contains many small lakes. Mount Whitney and Tehipite sheets.

Garlic Meadow Creek (R); Fresno County; rises in the northwestern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, on the south slope of Rodgers Ridge, at altitude 8,500 feet above sea level; flows southwestward 1½ miles, then southeastward 3 miles into Kings River (tributary to San Joaquin River); fall, 6,800 feet. Tehipite sheet.

Garnet Lake; Madera County; northern part of the Sierra National Forest, 1 mile southeast of Thousand Island Lake; three small inflowing streams, the longest of which drains a portion of the northern slope of Banner Peak; outlet, a stream one-half mile long flowing northeastward into Middle Fork of San Joaquin River; elevation, 9,704 feet; fall of outlet, 700 feet. Mount Lyell sheet.

Garzos Creek (L); Stanislaus and Merced counties; rises in the northern part of T. 9 S., R. 6 E.; flows northward 6 miles, then, in general, eastward to San Joaquin Valley, into which it discharges south of Newman; carries water only during the rainy season; tributaries, Mule Gulch and Oak Gulch creeks. Orestimba-Panoche-Cantua special map.

Givens Creek (R); Madera County; Yosemite National Park; rises in the western part of T. 4 S., R. 23 E., on the south slope of Buena Vista Crest, at altitude 9,200 feet; flows irregularly southward 4 miles into South Fork of Merced River; fall, 2,100 feet. Yosemite National Park map.

Glacier Creek (L); Fresno County; rises in Sierra National Forest, 2 miles northeast of Glacier Monument, at altitude 10,500 feet above sea level; flows westward 2½ miles into South Fork of Kings River, near the upper end of Kings River canyon; fall, 5,000 feet. Tehipite sheet.

Glacier Creek (R); Fresno County; Sierra National Forest; rises on the western slope of the Palisades in a glacial lake at altitude 11,600 feet above sea level; flows southwestward 2 miles into Palisade Creek (tributary to Middle Fork of Kings River and thus through Kings River to the San Joaquin); fall, 2,800 feet. Mount Goddard sheet.

Glacier Lake; Tulare County; southwestern part of T. 15 S., R. 32 E., north of Triple Divide Peak; outlet, Roaring Fork River to South Fork Kings River; altitude, 11,700 feet; very small. Tehipite sheet.

Goddard Creek (R); Fresno County; Sierra National Forest; rises on the south slope of Mount Goddard (altitude 13,555 feet); flows southeastward 10 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 6,000 feet; principal tributary, Disappearing Creek; many very small tributaries, fed by glacial lakes, of which more than 50 are shown on the map. Mount Goddard and Tehipite sheets.

Goddard Creek, North (R); Fresno County; rises on the north slope of Goddard Divide, in the Sierra National Forest, one-half mile southwest of Wanda Lake, at

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altitude 12,100 feet above sea level; flows very irregularly northwestward about 5 miles to junction with South Fork of San Joaquin; passes through several lakes of which the largest is 1 mile long and nearly half a mile wide; the elevation of this lake is 11,090 feet above sea level; in the 3 miles below the lake North Goddard falls about 2,000 feet. Mount Goddard sheet.

Gold Creek. *See* Fine Gold Creek; Coarse Gold Creek.

Golden Gate Creek (R); Amador County; rises in the northern part of T. 7 N., R. 13 E., Mount Diablo base and meridian, at altitude 2,750 feet above sea level; flows southwestward 1½ miles, then southward 1½ miles into Sutter Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin); fall, 1,200 feet. Jackson sheet.

Golden Trout Creek (L); Tulare County; rises in the northeastern part of T. 17 S., R. 34 E., Mount Diablo base and meridian, 1 mile southwest of Cirque Peak, at altitude 11,100 feet above sea level; flows west of south 8 miles, then very irregularly westward 7 miles to its junction with Kern River; fall, 4,600 feet; principal tributary, stream from Rocky Basin Lakes. In the central part of T. 18 S., R. 34 E., the natural course of the South Fork of the Kern carries it very close to Golden Trout Creek, and water has been diverted from the head of the South Fork to Golden Trout Creek and thus to Kern River by means of "The Tunnel." Olancha sheet.

Gopher Creek (R); Calaveras and Stanislaus counties; rises in the northeastern part of T. 1 N., R. 11 E., Mount Diablo base and meridian; flows southwestward 6 miles into Shirley Creek (tributary through Rock Creek to French Camp Creek, which discharges into San Joaquin Valley). Land Office map of California, 1907.

Granite Creek (R); Fresno County; Sierra National Forest; rises in a number of lakes in Granite basin, south of Granite Pass, at altitude about 10,500 feet above sea level; flows, in general, southward 6 miles into South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,500 feet, of which 1,000 feet is made in the last half mile. Tehipite sheet.

Granite Creek (R); Madera County; formed by the junction of East and West forks in Little Jackass Meadow, in the southern part of the Sierra National Forest; the West Fork, which drains the larger area and is, therefore, considered the continuation of the main stream, rises in the south slope of Triple Divide Peak (altitude 11,613 feet) and flows southeastward; length, 8 miles; fall above junction with East Fork, about 3,500 feet; this fork has many branches, of which three—Post, Timber, and Black Peak creeks—are named on the map; below the forks Granite Creek flows somewhat east of south 5 miles to its junction with Middle Fork San Joaquin River in the southern part of T. 5 S., R. 25 E., Mount Diablo base and meridian; fall below forks, about 3,000 feet. Mount Lyell and Kaiser sheets.

Granite Creek (L); Tulare County; Sequoia National Forest; rises in the eastern part of T. 16 S., R. 31 E., Mount Diablo base and meridian, well up toward the crest of the Great Divide, at altitude 11,200 feet above sea level; flows northwestward 5 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 6,000 feet; principal tributary, North Fork. Tehipite sheet.

Granite Creek, East Fork (L); rises in the western part of the Sierra National Forest, in a number of branching tributaries that drain the southern slope of Long Mountain and the eastern slope or Isberg Peak, at altitude 10,500 feet above sea level; flows somewhat east of south about 8 miles to its junction with West Fork of Granite Creek (tributary to Middle Fork of San Joaquin River) in Little Jackass Meadow; fall, above junction with West Fork, about 4,000 feet; tributaries small and unimportant; a number of small lakes in the upper part of the basin. Mount Lyell sheet.

Granite Creek, North Fork (R); Tulare County; Sequoia National Forest; rises in the eastern part of T. 16 S., R. 31 E., Mount Diablo base and meridian, on the western slope of the Great Western Divide, at altitude 11,000 feet above sea level; flows, in

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general, westward 4 miles to its junction with Granite Creek (tributary through Middle Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 4,700 feet. Tehipite sheet.

Granite Creek, West Fork. *See* Granite Creek.

Grant Lakes; Mariposa County; Yosemite National Park, northern part of T. 1 S., R. 22 E., Mount Diablo base and meridian; outlet, westward to Yosemite Creek (tributary through Merced River to San Joaquin River); two small lakes connected by a channel one-third mile long; altitude of the upper lake, 9,650 feet; of the lower lake, 9,150 feet. Yosemite National Park map.

Grapevine Creek (R); Kern County; rises on the southwestern slope of the Tehachapi Mountains, at altitude 4,000 feet above sea level; flows northwest and north toward Buena Vista Reservoir in San Joaquin Valley. At the head of this basin is Castac Lake (q. v.); about 1 mile below the lake are strong springs of sweet, soft water, which forms the source of Grapevine Creek. Tejon sheet. Called Fort Tejon Creek in Bull. U. S. Geol. Survey No. 140, 1896, pp. 256-257.

Gray Creek; Mariposa County; Yosemite National Park; rises on the northwestern slope of Gray Peak (altitude 11,581 feet); flows westward 3 miles into Clark Fork (tributary through Ottoway Creek to Illilouette Creek and thus through Merced River to the San Joaquin); fall, 2,700 feet. Yosemite National Park map.

Gray Peak Fork (L); Madera County; rises on the southern slope of Gray Peak, at altitude 11,000 feet above sea level; flows northward 4½ miles into Merced River (tributary to the San Joaquin); in Mariposa County, in the southwestern part of T. 2 S., R. 24 E.; fall, 3,500 feet. Mount Lyell sheet.

Greasy Creek (R); Tulare County; Sequoia National Forest; rises in the northern part of T. 17 S., R. 28 E., Mount Diablo base and meridian, at altitude 2,200 feet abovsea level; flows southwestward 5 miles into Kaweah River (tributary to Tulare Lake basin); fall, 1,700 feet; intermittent. Kaweah sheet.

Griswold Creek (L); Tuolumne County; rises in the southern part of T. 6 N., R. 17 E., Mount Diablo base and meridian, at altitude 6,800 feet above sea level; flows southwestward 17 miles into North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus River and thus to the San Joaquin); fall, 5,100 feet; prin, cipal tributaries, Skull, Soap, and McCormick creeks; the south grove of the Calaveras big trees lies on the divide between Griswold and Beaver creeks. Big Trees sheet.

Grizzly Creek (R); Eldorado County; rises in the northern part of T. 9 N., R. 13 E., Mount Diablo base and meridian, at altitude 4,150 feet; flows southwestward 1½ miles into Steeley Fork of North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 600 feet. Placerville sheet.

Grizzly Creek (R); Fresno County; Sierra National Forest; rises in the central part of T. 12 S., R. 30 E., at altitude 10,500 feet above sea level, on the southern slope of Monarch Divide; flows southeastward 2 miles, then southwestward 3½ miles into the South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 6,400 feet; principal tributary, West Fork. Tehipite sheet.

Grizzly Creek, Big (L); Mariposa County; rises in the northwestern part of T. 3 S., R. 19 E., Mount Diablo base and meridian, at altitude 4,900 feet above sea level; flows southeastward 1 mile, then southwestward 2 miles into Merced River (tributary to San Joaquin River); fall, 2,400 feet, of which 1,000 feet occurs in half a mile above the mouth. Yosemite sheet.

Grizzly Creek, Little (L); Mariposa County; rises in the southern part of T. 2 S., R. 19 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows southeastward 2 miles into Ned Gulch Creek (tributary through Merced River to the San Joaquin); fall, 3,000 feet. Yosemite sheet.

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Grizzly Creek, West Fork (R); Fresno County; Sierra National Forest; rises in the western part of T. 12 S., R. 30 E., on the eastern slope of Mount Harrington (altitude, 11,001 feet); flows southward 3 miles into Grizzly Creek (tributary to South Fork of Kings River and thus through Kings River to the San Joaquin); fall, 4,500 feet. Tehipite sheet.

Grizzly Gulch Creek (R); Eldorado County; rises in the southern part of T. 9 N., R. 11 E., Mount Diablo base and meridian, at altitude 1,900 feet above sea level; flows southwestward 1 mile into Spanish Creek (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 400 feet. Placerville sheet.

Grouse Creek (L); Mariposa County; Yosemite National Park; rises in the central part of T. 3 S., R. 21 E., Mount Diablo base and meridian, at altitude 7,300 feet above sea level; flows westward 4 miles into Merced River (tributary to San Joaquin River); fall, 4,200 feet, of which 1,000 feet occurs in the last one-third mile. Yosemite National Park map.

Grouse Creek (L); Tulare County; Sequoia National Park; rises in the northern part of T. 19 S., R. 29 E., Mount Diablo base and meridian, in upper Grouse Valley, at altitude 4,700 feet above sea level; flows, in general, northwestward 7 miles into South Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,000 feet; intermittent. Kaweah sheet.

Grouse Creek (R); Tuolumne County; rises in the southwestern part of T. 5 N., R. 21 E., Mount Diablo base and meridian, on the north slope of Relief Peak, altitude 10,788 feet; flows northwestward 3 miles into Relief Creek (tributary through Middle Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); fall, 2,800 feet. Dardanelles sheet.

Grouse Lake; Fresno County; Sierra National Forest; southwestern slope of Goat Mountain (altitude, 12,203 feet); one inlet; outlet, Copper Creek to South Fork of Kings River (tributary through Kings River to the San Joaquin); altitude, 10,550 feet; fall of outlet, 5,500 feet. Tehipite sheet.

Grouse Lake; Madera County; Yosemite National Park; central part of T. 4 S., R. 22 E., Mount Diablo base and meridian; outlet, a stream 2½ miles long flowing westward to Chilnualna Creek (tributary through South Fork of Merced River to Merced River and thus to the San Joaquin); altitude, 8,350 feet; fall of outlet, 1,050 feet; very small. Yosemite National Park map.

Guard Creek, North (L); Tulare County; rises in the northern part of T. 14 S., R. 32 E., Mount Diablo base and meridian, on North Guard Mountain (altitude, 13,304 feet); flows northward 3½ miles into Bubbs Creek (tributary to South Fork of Kings River); fall, 3,600 feet; passes through two small lakes. Mount Whitney sheet.

Guyot Creek (R); Tulare County; Sequoia National Forest; rises 1½ miles northeast of Mount Guyot, at altitude 11,300 feet above sea level; flows west of south 2½ miles into Rock Creek (tributary to Kern River); fall, 1,800 feet. Mount Whitney and Olancha sheets.

Hallock Creek (R); Madera County; rises in the eastern part of T. 8 S., R. 23 E., at altitude 5,300 feet above sea level; flows southward 4 miles into San Joaquin River; fall, 4,000 feet, of which 1,600 feet occurs in the last half mile of course. Kaiser sheet.

Harden Lake; Tuolumne County; Yosemite National Park; southern part of T. 1 N., R. 21 E., Mount Diablo base and meridian; no outlet shown on map, the contours indicate a pass northward to Tuolumne River (tributary to San Joaquin River). Yosemite National Park map.

Harriet Lake; Madera County; 1 mile southwest of Foerster Peak; several small inlets; outlet, a stream one-half mile long flowing northward to Foerster Creek (tributary through Triple Peak Fork to Merced River and thus to the San Joaquin); altitude, 10,250 feet; fall of outlet, 200 feet. Mount Lyell sheet.

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Hazel Green Creek (L); Tuolumne County; Stanislaus National Forest; rises in the northwestern part of T. 2 S., R. 19 E., Mount Diablo base and meridian, on the south slope of Crocker Ridge, at altitude 5,500 feet above sea level; flows northwestward 4 miles into South Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 1,950 feet. Yosemite National Park map.

Heart Lake; Fresno County; Sierra National Forest; 1 mile southwest of Mount Senger; one inlet; outlet, a stream 3 miles long flowing southward into Senger Creek (tributary to South Fork of San Joaquin River); altitude, 10,200 feet; fall of outlet, 2,500 feet. Mount Goddard sheet.

Helen Lake; Fresno County; Sierra National Forest; east of Goddard Divide, one-half mile northeast of Muir Pass; several small inflowing streams draining tiny lakes; outlet, a stream 1 mile long flowing north of east into a small lake on the Middle Fork of Kings River (tributary through Kings River to the San Joaquin); altitude, 11,612 feet; fall of outlet, 1,300 feet. Mount Goddard sheet.

Helen Lake; Mariposa County; Yosemite National Park; no outlet mapped; near-by streams flow northward to Merced River. Yosemite National Park map.

Helen Lake; Tuolumne County; Stanislaus National Forest; southern part of T. 4 N., R. 21 E., Mount Diablo base and meridian; one inlet; outlet, East Fork of Cherry Creek through Huckleberry Lake to Cherry Creek (tributary through Tuolumne River to the San Joaquin); altitude, 8,700 feet; fall of outlet in the 1½ miles above Huckleberry Lake, 1,000 feet; length, 1 mile; width, one-fourth mile. Yosemite National Park map.

Helen Lake; Tuolumne County; Yosemite National Park, east of Kuna Crest; outlet, South Fork of Dana Fork to Tuolumne River (tributary through Tuolumne River to San Joaquin River); altitude, 10,896 feet. Yosemite National Park map.

Helms Creek (R); rises in the northwestern part of T. 9 S., R. 28 E., at altitude 9,000 feet above sea level; flows southward 10 miles into North Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 2,300 feet. The eastern branch of this creek passes through Dusey Meadows. A western branch of the creek, to which the name North Fork of Kings River is applied on the Kaiser sheet of the United States Geological Survey, drains Helms Meadow. On Le Conte's map of a portion of the Sierra Nevada of California (No. 8, San Joaquin sheet), January, 1899, this stream is marked West Branch of North Fork of Kings River. Mount Goddard and Kaiser sheets.

Henley Canyon Creek (R); Amador County; Stanislaus National Forest; rises in the central part of T. 8 N., R. 15 E., Mount Diablo base and meridian, at altitude 6,300 feet; flows southeastward 2½ miles into Bear River (tributary through North Fork of Mokelumne River to Mokelumne River and thus to the San Joaquin); fall, 1,300 feet. Pyramid Peak sheet.

Herring Creek (R); Tuolumne County; Stanislaus National Forest; rises on the western slope of Eagle Peak at altitude 9,000 feet above sea level; flows, in general, southwestward to its junction with the South Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); length, 10 miles; fall, 3,600 feet. Dardanelles and Big Trees sheets.

Hidden Lake; Mariposa County; Yosemite National Park map, southwestern part of T. 1 S., R. 23 E., Mount Diablo base and meridian; a tiny lake which at times sends a small stream southward 1¼ miles to Tenaya Creek (tributary through Merced River to San Joaquin River) in Tenaya Canyon; altitude, 8,350 feet above sea level; fall of outlet, 2,400 feet, of which 1,700 feet is made at its entrance to the canyon. Yosemite National Park map.

Highland Creek (L); Alpine County; Stanislaus National Forest; rises in a small lake one-half mile southwest of Highland Lake and 1 mile southeast of Folger Peak, at altitude 8,650 feet above sea level; flows southwestward 12 miles, westward 4 miles, then north of west 1 mile into North Fork of Stanislaus River (tributary through Middle

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Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); fall, 3,200 feet; many small tributaries, some of which drain high, marshy meadows. Dardanelles and Big Trees sheets.

Highland Lake; Alpine County; Stanislaus National Forest; southwestern part of T. 8 N., R. 20 E., Mount Diablo base and meridian; 1 mile east of Folger Peak; outlet, North Fork of Mokelumne River to San Joaquin River; altitude, 8,650 feet. Dardanelles sheet.

Highland Reservoir; Alpine County; just north of Tuolumne County line; two inlets; outlet, a stream 1 mile long flowing from the southwestern end, west and then north to North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus and thus to the San Joaquin); altitude, 6,816 feet; length, about 1 mile; width, one-half mile. Dardanelles sheet.

Hilgard Branch (R); Fresno County; rises in Sierra National Forest, in the triangle formed by the southern slopes of Mount Gabb, Mount Abbott, and Mount Dade, at altitude 12,300 feet above sea level; flows southward 1 mile to the head of Lake Italy, then very irregularly westward to its junction with Bear Creek (tributary to South Fork of San Joaquin River); length, 6 miles; fall, 3,400 feet; basin contains a number of small lakes. Mount Goddard sheet.

Hoffman Creek (L); Fresno County; rises in Sierra National Forest, one-half mile north of Mount Tom, at altitude 7,000 feet above sea level; flows somewhat east of north to its junction with South Fork of San Joaquin River (head of San Joaquin); length, 3 miles; fall, 2,000 feet, of which 1,500 feet occurs in less than a mile at the mouth. Kaiser sheet.

Home Camp Creek (R); Fresno County; rises in the southern part of T. 7 S., R. 25 E., in Nellie Lake, at altitude 8,850 feet above sea level; flows southward 2 miles, then southeastward 3 miles into Big Creek (tributary to San Joaquin River); fall, 2,000 feet. Kaiser sheet.

Hookers Creek (R); Madera County; rises in the southwestern part of T. 8 S., R. 24 E., at altitude 4,000 feet above sea level; flows southeastward 3 miles to its junction with the San Joaquin; fall, 2,000 feet, of which 1,000 feet occurs in the last half mile. Kaiser sheet.

Hooper Creek (R); Fresno County; rises in Sierra National Forest, in small lakes on the north slope of Mount Hooper (altitude 12,322 feet); flows somewhat north of west to its junction with the South Fork of San Joaquin River (head of San Joaquin) in the eastern part of T. 7 S., R. 27 E., Mount Diablo base and meridian; fall, 3,500 feet. Mount Goddard sheet.

Hopkins Creek (R); Fresno County; rises in the Sierra National Forest, 1 mile southwest of Mount Crocker, at altitude 11,100 feet above sea level; flows, in general, east of south to its junction with Mono Creek (tributary to South Fork of San Joaquin River); length, 3 miles; fall, 1,900 feet. Mount Goddard sheet.

Hornitos Creek (R); Mariposa County; rises in the central part of T. 4 S., R. 16 E.; flows west of south 8 miles to its junction with Burns Creek (tributary through Bear Creek to the San Joaquin); intermittent. Sonora sheet; Fisk and Johnson map (on which it is not named).

Horse Creek (L); Amador County; rises in northern part of T. 6 N., R. 10 E., Mount Diablo base and meridian; at altitude 900 feet; flows westward 2 miles and northward 1 mile into Dry Creek (tributary through Mokelumne River to the San Joaquin); fall, 400 feet. Jackson sheet.

Horse Creek (L); Mariposa County; rises in the west-central part of T. 6 S., R. 19 E., on Striped Rock, at altitude 2,000 feet above sea level; flows southward 2½ miles into Striped Rock Creek (tributary through Chowchilla River to the San Joaquin); fall, 800 feet. Mariposa sheet.

Horse Creek (R); Tulare County; Sequoia National Park; rises in the northeastern part of T. 15 S., R. 30 E., Mount Diablo base and meridian; at altitude 10,600 feet

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above sea level; flows southwestward 3 miles into Marble Fork of Kaweah River (tributary through Middle Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 3,400 feet. Tehipite sheet.

Horse Creek (L); Tulare County; Sequoia National Forest; rises in the southern part of T. 18 S., R. 28 E., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows irregularly northward 7 miles into Kaweah River (tributary to Tulare Lake basin); fall, 1,100 feet; tributary, Jim Gray Creek; intermittent. Kaweah sheet.

Horse Creek (L); Tulare County; Sequoia National Park; rises in the central part of T. 18 S., R. 31 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level; flows westward 2 miles, then northwestward 6 miles into East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 5,500 feet; principal tributary, Cow Creek. Kaweah sheet.

Horseshoe Creek (L); Fresno County; Sierra National Forest; rises in Horseshoe Lakes west of Cirque Crest, at altitude 11,500 feet above sea level; flows northwestward 5 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,400 feet. Tehipite sheet.

Horseshoe Lakes; Fresno County; Sierra National Forest; west of Cirque Crest, a group of small glacial lakes discharging through Horseshoe Creek to Middle Fork of Kings River (tributary through Kings River to the San Joaquin); the highest of these lakelets is 11,100 feet above sea level, the lowest is 10,100 feet. Tehipite sheet.

Hospital Creek (L); San Joaquin County; rises in the northern part of T. 5 S., R. 5 E.; flows, in general, northeastward into San Joaquin Valley; carries water only during the rainy season; length, about 12 miles. Orestimba-Panoche-Cantua special map.

Hossack Creek (L); Tulare County; Sequoia National Forest; rises in the central part of T. 20 S., R. 31 E., Mount Diablo base and meridian., at altitude 7,300 feet above sea level; flows northwestward 3 miles into North Fork of Middle Fork of Tule River (tributary through Tule River to Tulare Lake basin); fall, 3,400 feet. Kaweah sheet.

Hotel Creek (R); Fresno County; Sierra National Forest; rises in the northwestern part of T. 13 S., R. 31 E., at altitude 8,500 feet above sea level; flows southwestward 3 miles into South Fork of Kings River (tributary through Kings River to the San Joaquin) at Cedar Grove Hotel; fall, 3,800 feet. Tehipite sheet.

Huckleberry Lake; Tuolumne County; Stanislaus National Forest, 1½ miles southwest of Helen Lake and 1¾ miles west of Twin Lakes; inlet, East Fork of Cherry Creek from Helen Lake; outlet, East Fork of Cherry Creek to Cherry Creek and thus through Tuolumne River to the San Joaquin; altitude, 7,700 feet; fall of the East Fork in the 3 miles between Huckleberry Lake and the mouth of the North Fork, 1,000 feet. Yosemite National Park map.

Hull Creek (R); Tuolumne County; Stanislaus National Forest; rises in the western part of T. 3 N., R. 18 E., at altitude 6,200 feet above sea level; flows southwestward 5 miles, then southeastward 3 miles into Clavey River (tributary through Tuolumne River to the San Joaquin); fall, 2,300 feet; principal tributary, Rush Creek. Big Trees sheet.

Humbug Creek (R); Mariposa County; rises in the northwestern part of T. 6 S., R. 19 E., on Bar Hill, at altitude 2,200 feet above sea level; flows southeastward 3 miles into West Fork of Chowchilla River (tributary through Chowchilla River to the San Joaquin); fall, 500 feet. Mariposa sheet.

Humbug Creek, Big (L); Tuolumne County; Stanislaus National Forest; rises in the eastern part of T. 1 S., R. 16 E., 4 miles northeast of Groveland, at altitude 2,750 feet above sea level; flows northwestward 4 miles into Tuolumne River (tributary to San Joaquin River); fall, 1,450 feet, of which 1,200 feet occurs in the last three-fourths mile; intermittent. Sonora sheet.

Hungry Hollow Creek (L); Eldorado County; rises in the northeastern part of T. 8 N., R. 9 E., Mount Diablo base and meridian, at altitude 1,000 feet above sea level;

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flows southeastward 2 miles into Indian Creek (tributary through Big Canyon Creek to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 500 feet. Placerville sheet.

Hunter Creek (L); Tuolumne County; rises in the central part of T. 1 N., R. 17 E., Mount Diablo base and meridian, at altitude 4,000 feet above sea level; flows, in general, south of west into North Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin). Gaging station near Tuolumne (1910–1912). Sonora sheet.

Hunter Creek (R); Calaveras County; rises in the western part of T. 7 N., R. 15 E., Mount Diablo base and meridian, at altitude 4,400 feet above sea level; flows south of west 3 miles, then southward one-half mile into North Fork of Middle Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 1,200 feet. Big Trees sheet

Hyatt Lake; Tuolumne County; Stanislaus National Forest; east of the north end of Cherry Ridge; one inlet; outlet, a stream 1 mile long flowing southwestward to Cherry Creek (tributary through Tuolumne River to the San Joaquin); altitude, 7,350 feet; fall of outlet, 1,000 feet. Yosemite National Park map.

Illilouette Creek (L); Madera and Mariposa counties; Yosemite National Park; rises on the north slope of Buena Vista Crest (altitude, 9,000 feet); flows northwestward 12 miles to its junction with Merced River (tributary to San Joaquin River) at the upper end of Yosemite Valley, just below Vernal Falls; fall, 5,000 feet, of which about 1,800 feet is made at the Illilouette Falls at the entrance to the valley; principal tributaries, Ottoway and Buena Vista creeks. Yosemite National Park map.

Indian Creek (L); Amador County; rises in the northeastern part of T. 7 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,400 feet above sea level; flows somewhat north of west 12 miles into Cosumnes River (tributary through Mokelumne River to the San Joaquin); one-half mile below the mouth of another Indian Creek which enters from the north; fall, 1,000 feet. Jackson and Lodi sheets.

Indian Creek (L); Calaveras County; rises in the eastern part of T. 3 N., R. 13 E., Mount Diablo base and meridian, at altitude 2,000 feet above sea level, 1½ miles southwest of Vallecito; flows southwestward 2 miles, then northwestward one-half mile into Sixmile Creek (tributary through Angels Creek to Stanislaus River and thus to the San Joaquin); fall, 650 feet. Jackson sheet.

Indian Creek (L); Calaveras County; rises in the eastern part of T. 4 N., R. 14 E., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows southwest 10 miles to San Antonio Creek (tributary to South Fork of Calaveras River and thus through Calaveras River to the San Joaquin). Big Tree and Jackson sheets.

Indian Creek (R); Eldorado County; rises in the central part of T. 8 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,400 feet above sea level; flows southwestward 2 miles into South Fork of Cosumnes River (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 800 feet. Placerville sheet.

Indian Creek (R); Eldorado County; rises in the southeastern part of T. 9 N., R. 9 E., Mount Diablo base and meridian, at altitude 1,400 feet above sea level; flows somewhat east of south 4 miles into Big Canyon Creek (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,000 feet; principal tributaries, Little Indian and Hungry Hollow creeks. Placerville sheet.

Indian Creek (R); Eldorado County; rises in the western part of T. 8 N., R. 9 E., Mount Diablo base and meridian, at altitude 500 feet above sea level; flows southeastward 3½ miles into Cosumnes River (tributary through Mokelumne River to the San Joaquin); fall, 300 feet. Sacramento sheet.

Indian Creek (L); Fresno County; Sequoia National Forest; rises in the west-central part of T. 13 S., R. 28 E., Mount Diablo base and meridian, 2 miles southeast

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of Converse basin, at altitude 6,500 feet above sea level; flows northeastward 4½ miles into Tenmile Creek (tributary through Kings River to the San Joaquin); fall, 2,800 feet. Tehipite sheet.

Indian Creek (L); Mariposa County; Yosemite National Park; rises in the west central part of T. 3 S., R. 21 E., at altitude 7,300 feet above sea level; flows southwestward 2 miles, then northwestward 4 miles into Merced River (tributary to San Joaquin River); fall, 5,300 feet. Gaging station near Tuolumne (1910–1912). Yosemite National Park map.

Indian Creek (R); Tuolumne County; a short stream unnamed on the map (Sonora sheet) which enters Clavey River (tributary through Tuolumne River to the San Joaquin) half a mile below the mouth of Reed Creek and 1 mile above the mouth of a short unnamed stream (Quilty Creek) which also enters from the right; Indian Creek, which has also been called Bear Creek, is about 1½ miles long and falls 1,500 feet. Gaging station near Tuolumne (1910–11). See Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 99.

Indian Creek, Big (L); Amador County; rises in the eastern part of T. 8 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,800 feet above sea level; flows north of west 6 miles, southwest 3 miles, irregularly westward 2 miles, then almost directly north 5 miles to its junction with Cosumnes River at Huse bridge; fall, 1,000 feet; principal tributary, Pigeon Creek. Placerville and Jackson sheets.

Indian Creek, Little (R); Eldorado County; rises in the east central part of T. 9 N., R. 9 E., Mount Diablo base and meridian, near Dugans, at altitude 1,300 feet above sea level; flows southeastward 2½ miles into Indian Creek (tributary through Big Canyon Creek to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 600 feet. Placerville sheet.

Ingram Creek (L); rises in the western part of T. 5 S., R. 6 E.; flows northeastward to San Joaquin Valley; length, 5 miles; carries water only during the rainy season; tributary, Cedar Creek. Orestimba-Panoche-Cantua special map.

Ireland Creek (L); Tuolumne County; Yosemite National Park; rises in the northeastern part of T. 2 S., R. 24 E., Mount Diablo base and meridian, in Ireland Lake, at altitude 10,650 feet; flows northeastward 3 miles into Lyell Fork of Tuolumne River; fall, 1,850 feet, of which 1,300 feet is made in the last mile of its course, in which it descends to Lyell Canyon. Yosemite National Park map.

Ireland Lake (L); Tuolumne County; Yosemite National Park; northeastern part of T. 2 S., R. 24 E., Mount Diablo base and meridian; one inlet; outlet, Ireland Creek to Lyell Fork of Tuolumne River (tributary through Tuolumne River to San Joaquin River); altitude, 10,650 feet. Yosemite National Park map.

Iron Creek (L); Madera County; rises in the northern part of the Sierra National Forest, on the south slope of the Minarets at altitude 10,000 feet above sea level; flows, in general, southwestward to junction of North Fork of San Joaquin River, tributary to Middle Fork of San Joaquin; length, 3 miles; fall, 3,000 feet; the most important tributary is a stream 1½ miles long flowing northwestward from a tiny lake on the west slope of Iron Mountain. Mount Lyell sheet.

Iron Creek (L); Madera County; Sierra National Forest; rises in the eastern part of T. 5 S., R. 22 E., at altitude 7,500 feet above sea level; flows north of west 2½ miles into South Fork of Merced River (tributary through Merced River to San Joaquin River); fall, 1,500 feet. Yosemite National Park map.

Italian Creek (L); Fresno County; rises in the southeastern part of T. 9 S., R. 23 E., at altitude 4,000 feet above sea level; flows east of north 2½ miles into San Joaquin River; fall, 2,500 feet. Kaiser sheet.

Italy Lake; Fresno County; Sierra National Forest; three-fourths mile east of Mount Hilgard; inlet, Hilgard Branch, which flows through the lake to its junction with Bear Creek (tributary to South Fork of San Joaquin River); elevation, 11,135 feet; length, 1 mile; maximum width, one-fourth mile. Mount Goddard sheet.

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Jacalitos Creek (R); Fresno County; rises in the northeastern part of T. 22 S., R. 13 E.; flows, in general, northeastward 18 miles to Los Gatos Creek, with which it unites in Coalinga Valley. Fisk and Johnson map; Land Office map of California. 1907.

Jackass Canyon Creek (L); Eldorado County; rises in the eastern part of T. 9 N., R. 12 E., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows northwestward 3 miles into North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,000 feet. Placerville sheet.

Jackass Creek (L); Amador County; rises in the southern part of T. 6 N., R. 11 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows westward 2 miles into Jackson Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin); fall, 600 feet. Jackson sheet.

Jackass Creek (R); Madera County; rises in the northern part of T. 5 S., R. 24 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows southward 16 miles to its junction with San Joaquin River, in the southeastern part of T. 6 S., R. 24 E.; fall, 5,100 feet, of which 2,300 feet occurs in the last 5 miles; in its upper course the creek flows through a broad, open meadow; principal tributary, West Fork. Mount Lyell and Kaiser sheets.

Jackass Creek, West Fork (R); Madera County, Sierra National Forest; rises in the northern part of T. 6 S., R. 24 E., at altitude 6,300 feet above sea level; flows southwestward 2½ miles, then southeastward 2½ miles into Jackass Creek, through which it is tributary to San Joaquin River; fall, 3,000 feet. Kaiser sheet.

Jackson Creek (L); Amador County; rises in the southern part of T. 7 N., R. 12 E., Mount Diablo base and meridian, just south of Pine Grove, at altitude 2,500 feet above sea level; flows, in general, southwestward 16 miles to a point just south of Buena Vista, where it turns and flows northwestward 5 miles to its junction with Dry Creek (tributary through Mokelumne River to the San Joaquin); fall, 2,100 feet; principal tributaries, South Fork and Jackass creeks. Jackson sheet.

Jackson Creek (L); Tulare County; Sierra National Forest; rises in the northern part of T. 21 S., R. 35 E., Mount Diablo base and meridian, on Smith Mountain, at altitude about 8,700 feet above sea level; flows southward 5 miles into Fish Creek (tributary through South Fork of Kern River to Kern River); fall, 1,300 feet. Olancha sheet.

Jackson Creek, South Fork (L); Amador County; rises south of Pine Grove, at altitude 2,800 feet above sea level; flows southwestward 3 miles, then westward 5 miles to its junction with Jackson Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin) at Jackson; fall, 1,600 feet. Jackson sheet.

Jawbone Creek (L); Tuolumne County; Stanislaus National Forest; rises in the east-central part of T. 2 N., R. 18 E., at altitude 5,900 feet above sea level; flows southwestward 4 miles into Reed Creek (tributary through Clavey River to Tuolumne River and thus to the San Joaquin); fall 1,900 feet; upper stretch intermittent. Dardanelles and Sonora sheets.

Jawbone Creek (R); Tuolumne County; Stanislaus National Forest; rises in the eastern part of T. 2 N., R. 18 E., Mount Diablo base and meridian, at altitude 5,900 feet above sea level; takes a general course west of south to its junction with Tuolumne River (tributary to the San Joaquin); length, 12 miles; fall, 3,700 feet, of which 1,000 feet occurs in the last half mile of the course. Gaging station near Tuolumne (1910–1912). Dardanelles, Yosemite, and Sonora sheets.

Jennie Lake; Tulare County; Sequoia National Forest; southwestern part of T. 14 S., R. 30 E., Mount Diablo base and meridian; outlet, Boulder Creek to South Fork of Kings River (tributary through Kings River to the San Joaquin); altitude 9,050 feet above sea level. Tehipite sheet.

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Jesus Maria Creek (L); Calaveras County; rises in the eastern part of T. 5 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,000 feet above sea level; flows south of west 12 miles, then northwestward 5 miles into North Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 3,000 feet. Big Trees and Jackson sheets.

Jim Gray Creek (R); Tulare County; Sequoia National Forest; rises in the eastern part of T. 18 S., R. 28 E., Mount Diablo base and meridian, at altitude 2,300 feet above sea level; flows southwestward 4 miles, then northwestward 1 mile into Horse Creek (tributary through Kaweah River to Tulare Lake basin); fall, 900 feet; intermittent; tributary, Wells Creek. Kaweah sheet.

Johns Creek, Little (R); Calaveras County; rises in the northern part of T. 1 N., R. 12 E., Mount Diablo base and meridian; flows east of south into Stanislaus River (tributary to San Joaquin River) 3 miles northeast of Knights Ferry; length, 6 miles. Land Office map of California, 1907.

Johnson Lake; Madera County; Yosemite National Park, eastern part of T. 4 S., R. 22 E.; one inflowing stream; outlet, a stream 2 miles long, flowing southward to South Fork of Merced River (tributary through Merced River to the San Joaquin); altitude, 8,550 feet; fall of outlet, 2,500 feet. Yosemite National Park map.

Jordan Creek (R); Mariposa County; rises in the northern part of T. 2 S., R. 17 E., Mount Diablo base and meridian, 2 miles east of Hobron Mill, at altitude 3,100 feet above sea level; flows southeastward 5 miles into North Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 600 feet. Sonora sheet.

Jose Creek (L); Fresno County; rises in the northern part of T. 10 S., R. 24, E., near Pine Ridge, at altitude 4,000 feet above sea level; flows northward 4½ miles into Mill Creek (tributary to San Joaquin River); fall, 2,500 feet. Kaiser sheet.

Josephine Lake; Tulare County; extreme southern corner of T. 14 S., R. 31 E., just north of Glacier Ridge; one inlet, draining two small lakes; outlet, a stream 1 mile long, flowing north of east into Roaring River (tributary to South Fork of Kings River); altitude 10,500 feet; fall of outlet, 2,100 feet. Tehipite sheet.

Kaiser Creek (R); Fresno County; rises in the southern part of T. 7 S., R. 26 E., Mount Diablo base and meridian, on the northern slope of Kaiser Ridge near Kaiser Pass, at altitude 9,700 feet above sea level; flows northwestward 7 miles, then westward 7 miles to its junction with San Joaquin River in the northeastern part of T. 7 S., R. 24 E.; fall, 4,600 feet; many small, branching tributaries, most of which drain the northern slope of Kaiser Crest and ridge. Kaiser sheet.

Kaweah River (R); Tulare County; formed in the northern part of T. 17 S., R. 29 E., Mount Diablo base and meridian, in the Sequoia National Forest, by the confluence of its Middle and East forks; the Middle Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the southwestern part of T. 15 S., R. 32 E., in Lion Lake, at altitude 10,900 feet above sea level, and takes a general southwesterly course which is continued by the main stream from the junction of the East Fork to its entrance to San Joaquin Valley; emerging from the foothills, the stream is carried across the delta fan through several distributaries which enter Tulare Lake near Corcoran; length above the delta, about 45 miles; drainage area, about 715 square miles.

The topography of the basin is varied, altitudes ranging from a few hundred feet at the foothills to more than 12,000 feet at the eastern border; the upper parts of the basin contain many domes and ridges, interspersed between upland meadows and glacial lakelets; most of the streams have fairly well developed canyons and moderately steep slope.

Mean annual precipitation ranges from 10 inches in the valley to 20 inches on the lower elevations, and probably 40 inches in the mountains. On probably half the area it occurs chiefly as snow.

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The Sequoia National Park, situated almost entirely in the Kaweah basin, contains the largest growth of big trees (*Sequoia gigantea*) in the Sierra. Practically all the area outside the park is included in the national forest.

The total flow at moderate and low stages is diverted for irrigating land in Tulare County; only the flood flow reaches the lake.

Streams gradients in this basin are comparatively heavy and the minimum flow is sufficient to generate about 30,000 horsepower without storage. For at least six months of the year more than 100,000 horsepower could be obtained.

Gaging station at Wachumna Hill (1878–1884), below Three Rivers (1903–1912).

Surveys and data: Tehipite and Kaweah sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 181-182.

Kaweah River, East Fork (L); Tulare County; Sequoia National Park; rises in the southwestern part of T. 17 S., R. 32 E., Mount Diablo base and meridian, on the western slope of the Great Western Divide, in Silver Lakes, at altitude 10,250 feet above sea level; flows, in general, somewhat north of west to the northern part of T. 17 S., R. 29 E., where it unites with the Middle Fork to form Kaweah River (tributary to Tulare Lake basin); length, including the major windings, 20 miles; fall, 9,000 feet; principal tributary, Horse Creek; the upper part of the basin contains many glacial lakelets, some of which are mapped as without outlet. Kaweah sheet.

Kaweah River, Middle Fork. *See* Kaweah River.

Kaweah River, North Fork (R); Tulare County; Sequoia National Forest; formed in the northwestern part of T. 15 S., R. 29 E., Mount Diablo base and meridian, by the union of Stony and Dorst creeks (q. v.); flows southwestward 5 miles and very irregularly southward 12 miles to its junction with Kaweah River (tributary to Tulare Lake basin) two miles north of Three Rivers; fall from the head of Dorst Creek to Kaweah River, 8,100 feet; fall below the junction of Stony and Dorst creeks, 4,700 feet; principal tributaries, below the forks, Redwood, Pierce, Eshom, Cow, Cactus, and Sheep creeks. Gaging station at Kaweah (1910–1912). Tehipite and Kaweah sheets.

Kaweah River, South Fork (L); Tulare County; Sequoia National Park; rises in the northeastern part of T. 18 S., R. 31 E., Mount Diablo base and meridian, in a group of glacial lakelets, the highest of which lies 10,650 feet above sea level; flows southwestward 4 miles, then takes a general course north of west to its junction with Kaweah River (tributary to Tulare Lake basin) one-half mile west of Three Rivers; length, 23 miles; fall, 9,900 feet; drainage basin narrow; tributaries all short, intermittent streams. Gaging station near Three Rivers (1911–1912). Kaweah sheet.

Kearsarge Lakes; Fresno County; Sierra National Forest; 1½ miles north of the Fresno-Tulare County line, at the east base of Kearsarge Pinnacles; several small connected lakes, the highest at altitude 12,009 feet above sea level; outlet, through Bullfrog Lake to Bubbs Creek (tributary to South Fork of Kings River). Mount Whitney sheet.

Kelso Creek (L); Kern County; Sierra National Forest; rises in the southeastern part of T. 28 S., R. 35 E., Mount Diablo base and meridian; flows north of west 16 miles; discharges into the valley of the South Fork of Kern River (tributary to Kern River) 2 miles east of Weldon; sinks before reaching the river; intermittent; principal tributaries, Frog, Pinyon, Staff, and Canebrake creeks. Kernville sheet.

Kennedy Canyon Creek (R); Fresno County; Sierra National Forest; rises on Kennedy Mountain in the eastern part of T. 12 S., R. 30 E., Mount Diablo base and meridian, at altitude 10,400 feet above sea level; flows northward 2 miles, then northwestward 2 miles into Slide Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); fall, 2,500 feet. Tehipite sheet.

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Kennedy Lake; Tuolumne County; south-central part of T. 5 N., R. 21 E., Mount Diablo base and meridian, at north base of Kennedy Peak; inlet, East Fork of Relief Creek; outlet, East Fork of Relief Creek through Relief Creek to Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); altitude, 7,820 feet. Dardanelles sheet.

Kern Lake, Kern County. *See* Buena Vista reservoir.

Kern Lake; Tulare County; Sequoia National Forest; southern part of T. 18 S., R. 33 E., Mount Diablo base and meridian; an expansion of Kern River; outlet, lower end of Kern River canyon; altitude, 6,233 feet. Olancha sheet.

Kern River (R); rises in glacial lakelets among the high peaks of the Sierra divide, and on the Kings-Kern and Great Western divides; flows directly southward about 70 miles, then southwestward to the mouth of its canyon a few miles northeast of Bakersfield, where it enters the southern end of San Joaquin Valley; total length from the source of the river to Bakersfield, about 140 miles; drainage area above the valley rim, 2,570 square miles.

The basin is the largest and most southerly of all the areas tributary to the San Joaquin Valley from the Sierra; it extends farther to the east than any of the other basins, from which it differs also in that its main axis is north and south instead of east and west; it is long and comparatively narrow, and lies west of the main High Sierra divide, but east of the secondary parallel crest, called the Great Western Divide, which separates it from the basins of Kaweah and Tule rivers and the southern foothill streams at the west. At the north it is separated from Kings River basin by a cross range about 15 miles long, known as the Kings-Kern divide.

Altitudes in the Kern River basin range from a few hundred feet at the mouth of the river's lower canyon to more than 14,000 feet at the headwaters. More than 50 of the peaks exceed 13,000 feet in altitude, and many of the lakes which feed the upper stream are at an altitude of 11,000 feet or more.

Mount Whitney, the highest mountain in the United States proper, towering 14,501 feet above sea level, overlooks the northern part of the Kern basin from the east.

The principal tributary of Kern River is its South Fork (q. v.); above the point of confluence, the two streams are about equal in length and drainage area and flow parallel to each other and to the marginal rims.

The basin is divided into two lesser basins by a ridge which extends northward from the junction of the South Fork with the main stream to an intersection with the Sierra divide near Trail Peak about 12 miles south of Mount Whitney. The two basins differ greatly in topography. The eastern basin is characterized by comparatively low, flat, and irregular hills, separated by many intervening meadows, large and small; it is drained by the South Fork. The western basin is characterized by high glaciated peaks and ridges and by deep canyons; it is drained by the main stream, which flows for a great part of its length through a narrow canyon. Kern River canyon proper is about 20 miles long, 1 mile wide at the top, and 1,500 to 2,000 feet deep. It begins at Junction Meadow 7 miles west of Mount Whitney at an altitude of 8,000 feet above sea level and runs due south to Kern Lake. The bottom of the canyon is several hundred feet wide and the average gradient is 100 feet to the mile. The main canyon is intersected by short cross canyons, chiefly from the west. Above the junction of Kern River and South Fork, the canyons broaden out into valleys of considerable size, especially on the South Fork; below the valleys, however, the main stream again enters a rough canyon, which it follows to its entrance into San Joaquin Valley.

The mean annual precipitation in Kern basin as a whole is small, partly because of the position of the basin in the southern region of the Sierra, which receives less rainfall than the central and northern regions, and partly because it lies east of the Great Western Divide, which intercepts the moisture-laden winds. In the southern part of the

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basin the precipitation is probably less than 10 inches annually; in the central part it may range from 10 to 17 inches. Fully 80 per cent of the total summer flow of the river at the mouth of its canyon is derived from the rainfall of the mountain area which lies within 15 miles of the source of the river.

In the foothills region of the Kern basin, the natural vegetation consists of grass and brush. At altitudes between 3,000 and 10,000 feet, the soil supports timber and underbrush; at altitudes above 10,000 feet, however, the area is practically devoid of timber. The entire basin is included in national forests.

Below the mouth of the lower canyon, the total low-water flow is diverted for irrigation around Bakersfield.

The minimum flow of the stream is sufficient to afford about 125,000 horsepower without storage.

Gaging stations near Bakersfield (1893–1912); at Isabella (1910–1912), at Rio Bravo ranch (1893–1912).

Surveys and data: Mount Whitney, Olancha, Tehipite, Kaweah, Kernville and Bakersfield sheets; Water-Supply Paper U. S. Geol. Survey No. 171, 1911, pp. 174–176.

Kern River, East Fork (R); Tulare County; Sequoia National Forest; rises in glacial lakelets on the west slope of the Sierra between Mount Tyndall and Mount Barnard, at altitude 11,900 feet above sea level; flows southwestward 7 miles into Kern River at Junction Meadow; fall, 3,900 feet; a south branch of this stream also drains numerous glacial lakes, two of which lie at altitudes exceeding 11,000 feet; half a mile east of the head of this south branch is Tulainyo Lake (q. v.). Mount Whitney sheet.

Kern River, South Fork (L); Tulare and Kern counties; rises on the western slope of the Sierra in the western part of T. 17 S., R. 35 E., Mount Diablo base and meridian, 15 to 20 miles south of the headwaters of the main stream, at an altitude of 10,500 feet above sea level; flows southward about 50 miles, then westward about 20 miles to its junction with the main stream at Isabella; fall, 8,000 feet. The basin is characterized by comparatively low, flat, and irregular hills, separated by many intervening meadows; the run-off from this part of the Kern basin is much smaller than that of the main branch; the basin of the South Fork affords many excellent reservoir sites; principal tributaries, Mulkey, Monache, Soda, Fish, Smith, Chimney, Kelso, and Fay creeks. Gaging stations near Onyx (1911–12), near Isabella (1910–1912). Olancha and Kernville sheets.

Kern River, Little (R); Tulare County, Sequoia National Forest; rises in the northeastern part of T. 18 S., R. 31 E., Mount Diablo base and meridian, on the southern slope of Vandever Mountain, at altitude 10,500 feet above sea level; flows, in general, east of south to its junction with Kern River in the southwestern part of T. 20 S., R. 33 E.; length, about 22 miles; fall, 6,000 feet; principal tributaries, Shotgun, Rifle, Soda, Alpine, Clicks, and Fish creeks. The basin is long and narrow, and lies on the western slope of the Great Western Divide; it contains a number of small lakes, which feed the smaller tributaries; altitudes range from 4,000 feet at the point of junction with the Kern to over 12,000 feet on the crest of the divide above; the river and its tributaries drain a number of open meadows. Kaweah and Olancha sheets.

Kern-Kaweah River (R); Tulare County; Sierra National Forest; rises in the northern part of T. 16 S., R. 32 E., Mount Diablo base and meridian, on the north slope of Kaweah Peaks, at altitude 11,500 feet above sea level; flows northwestward 1½ miles, northeastward 2 miles, then southeastward 5 miles into Kern River at Junction Meadow; fall, 3,300 feet. Tehipite and Mount Whitney sheets.

Kibbie Creek (R); Tuolumne County; Yosemite National Park; rises on the south slope of Mercur Peak (altitude, 8,072 feet); flows southwestward 3½ miles to Kibbie Lake, then, in general, west of south 5 miles to the lower end of Lake Eleanor;

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outlet, through Lake Eleanor to Cherry Creek and thus through Tuolumne River to the San Joaquin; fall below Kibbie Lake, 1,691 feet; no important tributaries. Yosemite National Park map.

Kibbie Lake; Tuolumne County; Yosemite National Park; northeastern part of T. 2 N., R. 19 E., Mount Diablo base and meridian; inlet, Kibbie Creek which flows through the lake to its junction with Lake Eleanor on Eleanor Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); altitude, 6,385 feet; fall of Kibbie Creek below the lake, 1,691 feet; about three-fourths mile long and one-half mile in maximum width. Yosemite National Park map.

Kid Creek (R); Fresno County; rises in Sierra National Forest, 2 miles east of Granite Pass, at altitude 10,900 feet above sea level; flows northeastward 2½ miles into South Fork of Kings River (tributary to San Joaquin River); fall, 3,000 feet. Tehipite sheet.

King Creek (R); Madera County; rises in the eastern part of the Sierra National Forest, in Beck Lakes, on the southeastern slope of the Minarets at altitude 10,600 feet above sea level; flows very irregularly southeastward 5 miles to junction with Middle Fork of San Joaquin River; fall below Beck Lakes, about 3,000 feet; tributaries, numerous but unnamed; the basin contains a number of small lakes, the largest of which lie north of Iron Mountain. Mount Lyell sheet.

Kings River (R); formed in Fresno County in the southeastern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, by the junction of the Middle and South forks; the South Fork, which drains the larger area and is therefore here considered the continuation of the main stream, has its source in numerous glacial lakelets that lie on the west slope of the Sierra well up toward the summit, flows, in general, southwestward about 20 miles, then north of west 20 miles to its junction with the Middle Fork, then in a general southwesterly course to the trough of San Joaquin about 6 miles west of Lemoore; from this point most of the low water flow passes northwestward through Kings Slough to San Joaquin River, about 3 miles north of Mendota, but most of the flood flow passes southward to Tulare Lake.

The basin touches the crest of the Sierra, which separates it from the central part of the Owens River divide at the east for a distance of about 50 miles, and it contains many of the highest peaks in the Sierra. Many of the peaks are perpetually snow-capped, others are sharp, bare, and precipitous. Nearly all the tributaries run in deep canyons cut through solid granite. The canyons of the three main forks and of the main stream below their junction are long and narrow and 2,000 to 3,000 feet deep; in places they broaden out into narrow valleys with precipitous walls like Kings River canyon on the South Fork and Tehipite Valley on the Middle Fork, which rival the famous Yosemite Valley in scenic grandeur.

The greater part of the Kings River basin is well forested; at altitudes above 10,000 feet vegetation is scanty; below 10,000 feet there is a heavy growth of timber and underbrush; extensive groves of big trees grow at many places in this basin; almost the entire basin above the valley rim lies in a national forest.

The mean annual precipitation varies with altitude; on the higher areas it is 50 to 60 inches and nearly all in the form of snow which never entirely disappears from the highest peaks; in the foothill region it is 20 to 30 inches and in the San Joaquin Valley 8 to 10 inches.

Numerous canals with a combined capacity of 4,000 to 5,000 second-feet divert water from the river below the mouth of the canyon for use on the valley lands in Fresno, Kings, and Tulare counties; during low water these canals take the total flow of the river.

Stream gradients are very heavy in this basin and the minimum flow is sufficient to generate at least 125,000 horsepower without storage. Middle and South forks afford the greatest opportunities for power development.

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Gaging stations at Slate Point (1878–1884), at Suspension Bridge (1895), at Kingsburg (1895–1904), near Sanger (1895–1911).

Surveys and data: Mount Whitney, Tehipite, and Mount Goddard sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 184–186.

Kings River, Middle Fork (R); Fresno County; Sierra National Forest; rises on the southern slope of Mount Fiske (altitude, 13,328 feet), east of the Goddard Divide; flows, in general, east of south 10 miles, then southwestward 20 miles to the southeastern part of T. 12 S., R. 28 E., where it unites with the South Fork to form Kings River (tributary to San Joaquin River); total fall above junction with South Fork, 8,500 feet; principal tributaries, Palisade, Cartridge, Goddard, Dougherty and Crown creeks, all of which have many branches; upper part of the basin contains many glacial lakes; throughout practically its entire course this fork of the Kings River flows in a canyon, 2,000 to 3,000 feet deep. The basin contains many high peaks, more than 20 exceeding 12,000 feet in altitude; the highest of the peaks are Mount Sill (14,254 feet), Mount Winchell (13,749 feet), Mount Goode (13,312 feet), Mount Fiske (13,328 feet), Mount Thompson (13,494 feet), and Mount Gilbert (13,232 feet). Mount Goddard and Tehipite sheets.

Kings River, North Fork (R); Fresno County, Sierra National Forest; rises in glacial lakes lying on the west slope of the White Divide (altitude, 12,401 to 12,495 feet); flows northwestward to the northeastern corner of T. 10 S., R. 28 E., Mount Diablo base and meridian, from which point it takes a general southwesterly course to its junction with Kings River in the southeastern part of T. 12 N., R. 26 E.; length, about 30 miles; principal tributaries, West Branch of North Fork, and Woodchuck, Rancheria, and Dinkey creeks; the headwater streams are fed by numerous glacial lakes; the highest peak in the basin is Mount Reinstein (altitude, 12,995 feet), at the head of White Divide. Gaging station at Ockenden (1910–1912). Mount Goddard, Tehipite, and Kaiser sheets; Land Office map, 1907; Le Conte's map of portion of the Sierra Nevada of California, No. 3, Kings-Kern sheet, March, 1903.

Kings River, South Fork. *See* Kings River.

Knight Creek (R); Tuolumne County; rises in the southern part of T. 4 N., R. 16 E., Mount Diablo base and meridian, at altitude 3,900 feet above sea level; flows southwestward 10 miles into Rose Creek (tributary through Stanislaus River to the San Joaquin); fall, 2,900 feet. Gaging stations near Jupiter (1910–1912). Big Trees sheet.

Kuna Creek (R); Tuolumne County; Yosemite National Park; rises on the southern slope of Kuna Peak (altitude, 12,951 feet); flows southwestward 1 mile, then almost directly west 2½ miles into Lyell Fork of Tuolumne River (tributary through Tuolumne River to San Joaquin River); fall, 2,800 feet. Yosemite National Park map.

Laurel Creek (R); Fresno County; Sierra National Forest; rises in the northeastern part of T. 10 S., R. 26 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows southwestward 3½ miles into Bear Creek (tributary through Dinkey Creek to North Fork of Kings River and thus through Kings River to the San Joaquin); fall, 2,100 feet. Kaiser sheet.

Laurel Creek (R); Tulare County; Sequoia National Forest; rises in the northeastern part of T. 18 S., R. 32 E., Mount Diablo base and meridian, at altitude 10,000 feet above sea level; flows north of east 4 miles into Kern River 1 mile below lower Funston Meadow; fall, 3,500 feet. Olancha sheet.

Laurel Lake; Tuolumne County; Yosemite National Park; southwestern part of T. 2 N., R. 20 E., Mount Diablo base and meridian; one inlet; outlet, a stream 1 mile long flowing southeastward to Frog Creek (tributary through Eleanor Creek to Cherry Creek and thus through Tuolumne River to the San Joaquin); altitude, 6,650 feet; fall of outlet, 300 feet; length and width, about one-half mile. Yosemite National Park map.

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Leland Gulch Creek (L); Madera County; rises in the southwestern part of T. 7 S., R. 20 E., at altitude 1,500 feet above sea level; flows northwestward 1½ miles into Chowchilla River (tributary to the San Joaquin); fall, 600 feet. Mariposa sheet.

Lewis Creek (R); Fresno County; Sierra National Forest; rises in the eastern part of T. 12 S., R. 30 E., on the west slope of Kennedy Mountain (altitude, 11,424 feet); flows southward 6 miles into South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,300 feet; principal tributaries, East Fork and Comb Creek. Tehipite sheet.

Lewis Creek (L); Tulare County; rises in the northwestern part of T. 20 S., R. 29 E., Mount Diablo base and meridian, at altitude 2,400 feet above sea level; flows westward into Tulare Lake basin; sinks near Lindsay between the delta fans of Tule and Kaweah rivers. Kaweah sheet; Land Office map of California, 1907.

Lewis Creek, East Fork (L); Fresno County; Sierra National Forest; rises in the eastern part of T. 12 S., R. 30 E., on the northern slope of Comb Spur, at altitude 10,700 feet above sea level; flows southwestward 3 miles into Lewis Creek (tributary to South Fork of Kings River and thus through Kings River to the San Joaquin); fall, 4,000 feet. Tehipite sheet.

Lewis Fork (R); Madera County; rises in the southeastern part of T. 5 S., R. 21 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows southward about 8 miles to its junction with Fresno River, in the southeastern part of T. 6 S., R. 21 E.; fall, about 2,000 feet. Mariposa sheet.

Licking Fork (R); Calaveras County; rises in the western part of T. 6 N., R. 15 E., at altitude 5,300 feet above sea level; flows, in general, southwestward 5½ miles, then northwestward 6 miles into South Fork of Mokelumne River (tributary to Middle Fork of Mokelumne River to Mokelumne River and thus to the San Joaquin); fall, 3,000 feet. Gaging station near Railroad Flat (1912). Big Trees sheet.

Lightning Creek (L); Fresno County; Sequoia National Forest; rises in the southern part of T. 13 S., R. 30 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows, in general, northward into South Fork of Kings River (tributary through Kings River to the San Joaquin); length, 3½ miles; fall, 4,000 feet. Tehipite sheet.

Lillian Lake; Madera County; Sierra National Forest; 1 mile east of Gale Peak; one inlet; outlet, a stream somewhat less than a mile long, flowing southeastward to Black Peak Fork (tributary through West Fork to Granite Creek and thus to Middle Fork of San Joaquin River); elevation, 8,880 feet; fall of outlet, about 500 feet. Mount Lyell sheet.

Lily Creek (L); Tuolumne County; Stanislaus National Forest; rises 2 miles south of the southwest corner of T. 5 N., R. 20 E., at altitude 8,800 feet above sea level; flows southwestward 13 miles into Clavey River (tributary through Tuolumne River to the San Joaquin); fall, 3,600 feet; flows through Lily Lake; tributaries few and unimportant. Dardanelles and Big Trees sheets.

Lily Creek (L); Tuolumne County; Stanislaus National Forest; rises 3½ miles southwest of the head of Cascade Creek, at altitude 6,000 feet above sea level; flows north of west 2 miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 2,400 feet, of which 1,400 feet is made in the last half mile. Dardanelles and Big Trees sheets.

Lily Lake; Tuolumne County; Stanislaus National Forest; 2 miles east of northeast corner T. 3 N., R. 18 E.; inlet Lily Creek; outlet Lily Creek to Clavey River (tributary through Tuolumne River to the San Joaquin); altitude 6,900 feet; fall of Lily Creek below Lily Lake 1,700 feet. Dardanelles sheet.

Limekiln Creek (R); Tulare County; rises in the western part of T. 14 S., R. 28 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southward 11 miles into Kaweah River (tributary to Tulare Lake basin) which it enters 2 miles north of Lemoncove. Land Office map of California, 1907.

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Line Creek (R); Fresno County; rises in the southern part of T. 7 S., R. 25 E., on the south slope of Kaiser Ridge, at altitude 9,700 feet above sea level; flows irregularly southward 4 miles into Big Creek (tributary to San Joaquin River); fall, 3,000 feet. Kaiser sheet.

Lion Creek (R); Calaveras County; rises in the southeastern part of T. 7 N., R. 14 E., Mount Diablo base and meridian, at altitude 3,900 feet above sea level; flows westward 2 miles into North Fork of Middle Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 1,000 feet. Big Trees sheet.

Lion Lake; Tulare County; Sequoia National Forest; southwestern part of T. 15 S., R. 32 E., Mount Diablo base and meridian, south of Triple Divide Peak; outlet, Middle Fork of Kaweah River through Kaweah River to Tulare Lake; altitude, 10,900 feet. Tehipite sheet.

Little. *See name of main stream.*

Little Lake; Tulare County; Sequoia National Forest; northern part of T. 19 S., R. 33 E., Mount Diablo base and meridian, 1 mile below Kern Lake; connected by two very short streams with Kern River; altitude 6,100 feet. Olancha sheet.

Lockwood Creek (L); Fresno County; Sequoia National Forest; rises in the northwestern part of T. 13 S., R. 29 E., on the northern slope of Sequoia Ridge, at altitude 6,000 feet above sea level; flows northwestward 2 miles into South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 3,200 feet. Tehipite sheet.

Lone Indian, Lake of; Fresno County; Sierra National Forest, north of the Silver Divide, near Silver Pass; one inlet draining 3 small lakes; outlet, a stream 1 mile long, flowing northward to Fish Creek (tributary through Middle Fork of San Joaquin to South Fork of San Joaquin, head of San Joaquin River); altitude, 10,250 feet; fall of outlet, 1,250 feet. Mount Goddard sheet.

Lone Tree Creek (L); San Joaquin County; rises in the southwestern part of T. 4 S., R. 5 E.; flows northeastward into San Joaquin Valley; length, 6 miles; carries water only during the rainy season. Orestimba-Panoche-Cantua special map.

Long Creek (R); Madera County; rises in the northwestern part of the Sierra National Forest, on the eastern slope of Long Mountain (altitude 11,468 feet); flows southeast 3 miles, then northeastward 1 mile into North Fork of San Joaquin River (tributary to Middle Fork San Joaquin); fall, 2,600 feet; flows through several small lakes. Mount Lyell sheet.

Long Gulch Creek (R); Tuolumne County; Yosemite National Park; rises in the eastern part of T. 1 S., R. 20 E., Mount Diablo base and meridian, at altitude 6,900 feet above sea level; flows southwestward 2 miles, then southward 2 miles, into South Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 1,100 feet. Yosemite National Park map.

Longhollow Creek (R); Madera County; rises in the southern part of T. 8 S., R. 20 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows southward 2½ miles into Coarse Gold Creek (tributary through Fresno River to San Joaquin River); fall, 400 feet. Mariposa sheet.

Los Agitos Creek (L); San Benito County; rises in the southeastern part of T. 14 S., R. 9 E.; flows southeastward 8 miles to its junction with Panoche Creek 2 miles east of Llanada; carries water only during the rainy season. Land Office map of California, 1907.

Los Banos Creek (L); San Benito and Merced counties; rises in the northern part of T. 14 S., R. 8 E., flows northward 18 miles and northeastward 15 miles to San Joaquin Valley; sinks below the foothills. Land Office map of California, 1907; Fisk and Johnson map.

Los Gatos Creek (L); Fresno County; rises in the northwestern part of T. 19 S., R. 13 E.; flows southeastward to a point near Coalinga, then turns and flows eastward, then northeastward into San Joaquin Valley; length, about 40 miles; principal tributaries, White, Waltham, and Jacalitos creeks. Fisk and Johnson map of San Joaquin Valley; Land Office map of California, 1907.

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Lost Canyon Creek (L); Fresno County; Sierra National Forest; rises in the central part of T. 12 S., R. 30 E., Mount Diablo base and meridian, north of Monarch Divide, at altitude 10,400 feet above sea level; flows northward 4 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,500 feet, of which 2,500 feet is made in the last mile. Tehipite sheet.

Lost Canyon Creek (R); Fresno County; rises in the eastern part of T. 10 S., R. 27 E., Mount Diablo base and meridian, in a small lake at altitude 8,800 feet above sea level; flows northeastward 1 mile, then, in general, southward 3 miles into North Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 2,800 feet. Mount Goddard sheet.

Lost Canyon Creek (R); Tulare County; Sequoia National Forest; rises in the northwestern part of T. 17 S., R. 32 E., Mount Diablo base and meridian, on the eastern slope of the Great Western Divide, at altitude 10,300 feet above sea level; flows eastward 4 miles into Big Arroyo (tributary to Kern River); fall, 2,700 feet. Kaweah and Olancha sheets.

Lost Creek (R); Fresno County; Sierra National Forest; rises in the southwestern part of T. 10 S., R. 26 E., Mount Diablo base and meridian, in Lost Meadow, at altitude 5,800 feet above sea level; flows, in general, east of south to its junction with Dinkey Creek (tributary through North Fork of Kings River to Kings River and thus to the San Joaquin). Kaiser sheet.

Lost Creek (R); Tulare County; Sierra National Forest; rises in the north-central part of T. 21 S., R. 35 E., Mount Diablo base and meridian, in Albanita Meadows, at altitude 8,350 feet above sea level; flows, in general, southeastward 5½ miles into South Fork of Kern River (tributary to Kern River); fall, 2,200 feet. Olancha sheet.

Love Creek (L); Calaveras County; rises in the southern part of T. 5 N., R. 15 E., Mount Diablo base and meridian, 1 mile southeast of Big Trees, at altitude 4,400 feet above sea level; flows, in general, southwestward 4½ miles into Moran Creek (tributary through Mill Creek to North Fork of Stanislaus River and thus through Middle Fork of Stanislaus and Stanislaus River to the San Joaquin); fall, 1,000 feet. Big Trees sheet.

Lukens Lake; Tuolumne County; Yosemite National Park; eastern part of T. 1 S., R. 21 E., Mount Diablo base and meridian; outlet, a stream 1 mile long flowing northward to Middle Fork of Tuolumne River (tributary through South Fork of Tuolumne River to Tuolumne River and thus to the San Joaquin); altitude, 8,450 feet; fall of outlet, 300 feet; very small. Yosemite National Park map.

Lyell Fork. *See* Tuolumne River, Lyell Fork.

Lyell Fork (R); Madera County; rises on the southern slope of Mount Lyell (altitude, 13,090 feet); flows southwestward 2 miles, then westward 3 miles to its junction with Merced Peak Fork, with which it forms Merced River; flows through several small glacial lakes; fall, 4,000 feet. Mount Lyell sheet.

Lyell Fork, Merced River, North Fork of (R); Madera County; rises on the north slope of Mount Lyell (altitude 13,090 feet); flows southwestward 3 miles into Lyell Fork (tributary through Merced River to the San Joaquin); fall, 2,800 feet. Mount Lyell sheet.

Mahogany Creek (R); Tulare County; Sierra National Forest; rises in the southeastern part of T. 21 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows northeastward 1 mile, then southeastward 1½ miles into Fish Creek (tributary through South Fork of Kern River to Kern River); fall, 650 feet. Olancha sheet.

Manikin Creek (R); Tulare County; Sequoia National Park; rises in the northern part of T. 17 S., R. 28 E., at altitude 2,200 feet above sea level; flows southeastward 2 miles; sinks before reaching North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 1,200 feet; intermittent. Kaweah sheet.

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Manter Creek (R); Tulare County; Sierra National Forest; rises in the southern part of T. 23 S., R. 34 E., Mount Diablo base and meridian, at altitude 7,500 feet above sea level; flows eastward 3½ miles, then southeastward 3 miles into South Fork of Kern River (tributary to Kern River); fall, 2,500 feet. Kernville sheet.

Maple Creek (L); Tulare County; Sequoia National Forest; rises in the western part of T. 16 S., R. 29 E., Mount Diablo base and meridian, on the north slope of Ash Peaks, at altitude 3,000 feet above sea level; flows northward 1½ miles into Cactus Creek (tributary to North Fork of Kaweah River and thus through Kaweah River to Tulare Lake basin); fall, 1,000 feet. Tehipite sheet.

Marble Creek (R); Eldorado County; rises in the northwestern part of T. 9 N., R. 9 E., Mount Diablo base and meridian, 2 miles east of Clarksville, at altitude 1,200 feet above sea level; flows southeastward 3 miles into Deer Creek (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 500 feet. Sacramento sheet.

Marble Fork of Kaweah River; Tulare County; Sequoia National Park; rises in Table Meadows, in the northeastern part of the park, just east of the northeastern boundary of the park; at altitude 10,700 feet above sea level; takes a general southwesterly course to its junction with Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); length, 16 miles; fall, 8,700 feet; enters the middle fork through a deep canyon; principal tributaries, Silliman, Clover, and Wolverton creeks. Tehipite sheet.

Margaret Lakes; Fresno County; Sierra National Forest; west of Silver Peak and north of Saddle Mountain; two lakes connected by a channel one-half mile long; outlet, Silver Creek to Fish Creek (tributary through Middle Fork of San Joaquin to South Fork of San Joaquin, head of San Joaquin River); altitude of upper lake, 9,950 feet; the northern lake is 300 feet lower; each lake is about half a mile long and less than half a mile wide. Kaiser sheet.

Marie Lake; Fresno County; Sierra National Forest, one-half mile northwest of Mount Senger; several small inflowing streams; outlet, a stream 2 miles long, flowing first west to a small lake and then northward to Bear Creek (tributary to South Fork San Joaquin River) near the junction of the East and South forks; elevation 10,695 feet; fall of outlet, 800 feet; the outlet of this lake receives also the overflow from Rose Lake. Mount Goddard sheet.

Marion Lake; Fresno County; Sierra National Forest; 1 mile north of Marion Peak; outlet, Cartridge Creek to Middle Fork of Kings River (tributary through Kings River to the San Joaquin); altitude 10,350 feet above sea level. Tehipite sheet.

Mariposa Creek (R); Mariposa and Merced counties; rises in the foothills in the northern part of Las Mariposas at altitude 2,300 feet above sea level; flows southeastward 4 miles, passing through the town of Mariposa, southward 2 miles, then in general southwestward into Mariposa Slough, through which it is connected with the San Joaquin; drainage area about 122 square miles (W. Ham. Hall); a small stream characterized by sudden rises after heavy rains; carries no water after the rainy season; enters the valley through several interlocking channels. Gaging station at base of foothills (1878–1884). Mariposa sheet; Fisk and Johnson map; Bull. U. S. Geol. Survey No. 140, 1895, pp. 295–296.

Martha Lake; Fresno County; 1 mile southwest of Mount Goddard (elevation 13,555 feet), one-half mile east of the northeast corner of T. 10 S., R. 29 E., Mount Diablo base and meridian; inlets, two small streams flowing from the south slope of Mount Goddard; outlet, South Fork of San Joaquin River (head of San Joaquin); elevation, 11,007 feet. Mount Goddard sheet.

Martinez Creek (R); Eldorado County; rises in the southwestern part of T. 10 N., R. 11 E., Mount Diablo base and meridian, near Diamond Springs, at altitude 1,900 feet above sea level; flows southward 5 miles into North Fork of Cosumnes River

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(tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 900 feet; principal tributary, Squaw Hollow Creek. Placerville sheet.

Mary Lake; Tuolumne County; Yosemite National Park, southern part of T. 4 N., R. 22 E., Mount Diablo base and meridian, 1 mile west of Tower Peak; outlet, a stream 2½ miles long, flowing southwestward through Tilden Lake to Falls Creek (tributary through Tuolumne River to the San Joaquin); altitude, 9,650 feet; fall, of outlet stream above Tilden Lake, 800 feet. Yosemite National Park map.

Matterhorn Canyon Creek (L); Tuolumne County; Yosemite National Park; rises in the western part of T. 3 N., R. 24 E., Mount Diablo base and meridian, at altitude 10,800 feet above sea level; flows southwestward 10 miles to its junction with West Fork of Return Creek (tributary through Tuolumne River to San Joaquin River); fall, 3,300 feet. This stream is much longer than the West Fork of Return Creek and should more properly be considered the main stream to which the West Fork is a tributary. Yosemite National Park map.

Mattie Lake; Tuolumne County; Yosemite National Park; central part of T. 1 N., R. 23 E., Mount Diablo base and meridian; outlet, a stream 1 mile long, flowing southward toward Tuolumne River (tributary to San Joaquin River); the outlet stream sinks before reaching the river; altitude of lake, 9,300 feet. Yosemite National Park map.

Maxwell Creek (R); Mariposa County; rises in the central part of T. 2 S., R. 16 E., Mount Diablo base and meridian, at altitude 3,200 feet; flows southward 5 miles, northwestward 2 miles, then again southward 2 miles into Merced River (tributary to the San Joaquin River) at Horseshoe Bend; fall, 2,500 feet; principal tributary, Blacks Creek; intermittent. Sonora sheet.

May Lake; Mariposa County; Yosemite National Park; western part of T. 1 S., R. 23 E., Mount Diablo base and meridian; outlet, Snow Creek to Tenaya Creek (tributary through Merced River to San Joaquin River); length and width each nearly half a mile. Yosemite National Park map.

McCabe Lakes; Tuolumne County; Yosemite National Park; southern part of T. 2 N., R. 24 E., Mount Diablo base and meridian; five small lakes, two of which have no visible outlet; three of them are connected and discharge by a stream one-half mile long, flowing northwestward to Return Creek (tributary through Tuolumne River to San Joaquin River); the altitude of the lowest lake is 9,900 feet above sea level, the highest is 10,480 feet; the highest lake is about one-half mile long, one-eighth mile wide, is not connected with the other lakes, and has no outlet. Yosemite National Park map.

McClure Fork (R); Mariposa County; rises in the northeastern part of T. 2 S., R. 24 E., on the north slope of McClure Mountain, at altitude 11,800 feet above sea level; flows northward along the base of Simmons Peak, then very irregularly southwestward to its junction with Merced River (tributary to San Joaquin River) just above Merced Lake; length, 8 miles; fall, 4,500 feet; principal tributaries, Florence and Fletcher creeks; basin contains many small glacial lakes. Mount Lyell sheet.

McClure Fork (L); Tuolumne County; Yosemite National Park; rises in a glacier on the eastern slope of McClure Mountain, at altitude 12,000 feet above sea level; flows northeastward 2 miles into Lyell Fork of Tuolumne River (tributary through Tuolumne River to San Joaquin River); fall, 2,400 feet. Yosemite National Park map.

McClure Lake; Madera County; Sierra National Forest; 1 mile south of Isberg Peak; inlet, a stream from the north slope of Post Peak; outlet, a stream one-half mile long, flowing eastward to Sadlier Lake on East Fork of Granite Creek (tributary through Granite Creek to Middle Fork of San Joaquin River); elevation, 9,550 feet; fall of outlet, 200 feet. Mount Lyell sheet.

McCormick Creek (L); Tuolumne County; rises in the eastern part of T. 4 N., R. 15 E., Mount Diablo base and meridian, at altitude 3,800 feet above sea level;

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flows, in general, south of west 2½ miles into Griswold Creek (tributary through North Fork of Stanislaus to Middle Fork of Stanislaus and thus through Stanislaus River to the San Joaquin); fall, 1,800 feet. Big Trees sheet.

McCormick Creek (R); Alpine and Tuolumne counties; Stanislaus National Forest; rises in the southern part of T. 7 N., R. 19 E., Mount Diablo base and meridian, on the south slope of the Dardanelles, at altitude 8,400 feet above sea level; flows southwestward 2 miles, then southward 2½ miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 3,000 feet, of which 1,200 feet occurs in about half a mile as it enters the Stanislaus. Dardanelles sheet.

McGee Lake; Tuolumne County; Yosemite National Park, southeastern part of T. 1 N., R. 23 E., Mount Diablo base and meridian; outlet, a stream one-half mile long flowing southeastward to Tuolumne River (tributary to San Joaquin River) 1 mile below Tuolumne Falls; altitude, 8,200 feet; very small. Yosemite National Park map.

McGill Creek (L); Tuolumne County; Yosemite National Park; rises in the northwestern part of T. 1 N., R. 20 E., Mount Diablo base and meridian, in McGill Meadow, at altitude 5,500 feet above sea level; flows west and southwest 6 miles to its junction with Cherry Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,000 feet. Yosemite National Park map.

McIntire Creek (R); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 20 S., R. 32 E., Mount Diablo base and meridian, at altitude 7,800 feet above sea level; flows southwestward 3 miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule to Tule River and thus to Tulare Lake basin); fall, 2,400 feet. Kaweah sheet.

McKinneys Creek (R); Calaveras County; rises in the southeastern part of T. 5 N., R. 13 E., Mount Diablo base and meridian, at altitude 2,700 feet above sea level; flows very irregularly southwestward to the central part of T. 4 N., R. 13 E., where it unites with O'Neil Creek to form Calaveritas Creek (tributary to South Fork of Calaveras River and thus through Calaveras River to the San Joaquin); fall, 1,200 feet. Jackson sheet.

Meadow Brook (R); Fresno County; Sierra National Forest; rises 2½ miles southwest of Red Mountain, at altitude 9,900 feet above sea level; flows southwestward 3 miles into North Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 1,700 feet. Mount Goddard sheet.

Meadow Creek, Big (R); Calaveras County; Stanislaus National Forest; rises in the central part of T. 7 N., R. 17 E., Mount Diablo base and meridian, at altitude 7,700 feet above sea level; flows southwestward 2½ miles, and southeastward 2 miles into North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus River and thus to the San Joaquin); fall, 2,400 feet, of which 1,000 feet occurs in the last three-fourths mile; drains two high marshy meadows. Big Trees sheet.

Meadow Creek, Big (L); Tulare County; Sequoia National Forest; rises in the western part of T. 14 S., R. 29 E., in Big Meadow, at altitude 7,700 feet above sea level; flows, in general, northeastward to its junction with Boulder Creek through which it is tributary to the South Fork of Kings River (tributary through Kings River to the San Joaquin); length, 5 miles; fall, 1,200 feet; principal tributary, stream from Weaver Lake. Tehipite sheet.

Meadow Creek, Big (L); Tuolumne County; Yosemite National Park; rises in the southeastern part of T. 3 N., R. 23 E., Mount Diablo base and meridian, at altitude 10,500 feet above sea level; flows southwestward 2½ miles into Piute Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,700 feet. Yosemite National Park map.

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Meadow Creek, Dry (R); Tuolumne County; Stanislaus National Forest; rises in the northern part of T. 4 N., R. 17 E., Mount Diablo base and meridian, at altitude 5,500 feet above sea level; takes a general southwesterly course to its junction with Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 2,900 feet, of which 1,400 feet occurs in the last half mile; intermittent. Big Trees sheet.

Meadow Lake; Alpine County; Stanislaus National Forest; two lakes, southwest of East Blue Lake; three inflowing streams, one of which drains Twin Lake; outlet, a stream 2 miles long flowing southwestward to North Fork of Mokelumne River (tributary through Mokelumne River to North Fork of San Joaquin); altitude, 7,750 feet. Markleeville sheet.

Merced Lake; Mariposa County; Yosemite National Park; inlet, Merced River; outlet, Merced River to San Joaquin River; altitude, 7,150 feet. Yosemite National Park map.

Merced Peak Fork. *See* Merced River.

Merced River, Lyell Fork. *See* Lyell Fork.

Merced River (R); rises in numerous small glacial lakes in the region about Mount Lyell (altitude, 13,090 feet); the fork which carries the name of the river—Merced Peak Fork—flows northeastward from Edna Lake (altitude, 10,500 feet), and unites with the fork from Mount Lyell, 3½ miles above Merced Lake. From this lake the river takes a general southwesterly course to its junction with the lower San Joaquin, about 5 miles northeast of Newman. Total length, 135 miles; length through the mountains, about 90 miles; principal tributaries, Tenaya and Yosemite creeks from the north, Illilouette and Bridal Veil creeks and South Fork of Merced River from the south.

The drainage basin lies on the western slope of the Sierra, north of the upper San Joaquin basin and south of the basin of the Tuolumne; it touches the Sierra divide at only one point, Mount Lyell, which is common to the three basins. The basin is about 65 miles long from the rim of the valley to the crest; is 20 to 25 miles wide, and its area above the valley border is about 1,200 square miles.

Within this basin is the famous Yosemite Valley, less than a mile wide and about 7 miles long, margined by cliffs that rise almost vertically 2,000 to 3,000 feet; over these cliffs hung-up streams leap to the lower level in magnificent falls. The country around the valley rim is a rolling glaciated region, 3,000 to 8,000 feet higher than the floor of the valley, the altitude of which is 4,000 feet above sea level. The valley opens westward into Merced Canyon.

The upper reaches of the basin above Yosemite Valley are for the most part devoid of forests, but the middle reaches are timbered; the growth extends well down on the lower elevations to the foothills. In the basin of the South Fork is the Mariposa grove of big trees. All the upper part of the basin, amounting to about 850 square miles, is included in national forests.

Mean annual precipitation ranges from 10 inches in the San Joaquin Valley to about 25 inches in the foothills and probably 60 inches in the higher areas; it occurs almost entirely during the rainy season, November to April; the snowfall is heavy during the winter and early spring and melts most rapidly in May and June, when, except on the higher peaks, the greater part of it disappears. The melting snow produces a regular annual rise in the late spring and early summer, during which period the splendid falls in the Yosemite Valley attain their greatest beauty.

Almost the entire late summer flow of Merced River is utilized for irrigation on the bottom lands of the foothills and in parts of the San Joaquin Valley.

The minimum flow is sufficient to develop about 40,000 horsepower without storage; with storage, this amount could be increased to 160,000 horsepower, continuously.

Gaging stations at Merced Falls (1878–1884), above Merced Falls (1901–1912), near Newman (1912), in Yosemite Valley (1904–1909, 1912).

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Surveys and data· Mount Lyell, Yosemite, Sonora, and Mariposa sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 189–190.

Merced River, North Fork (R); Mariposa County; Stanislaus National Park; rises in the northeastern part of T. 2 S., R. 18 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; takes a general course west of south to its junction with Merced River (tributary to San Joaquin River); length, 14 miles; fall, 3,500 feet; principal tributaries Moore, Jordan, Smith, and Bull creeks; altitudes range from 1,500 to 6,000 feet above sea level. Yosemite and Sonora sheets.

Merced River, South Fork; Madera and Mariposa counties; rises on the south slope of Merced Peak (altitude 11,722 feet); flows southwestward 8 miles, almost directly west 12 miles, then takes a general northwesterly course for 16 miles to its junction with Merced River (tributary to San Joaquin River) at South Fork station on the Yosemite Valley Railroad; it enters the Merced at altitude about 1,500 feet above sea level; for about one-half its course it forms the southern boundary of the Yosemite National Park; its tributaries are all small; the upper part of the basin contains a number of small lakes. Gaging station near Wawona (1910–1912). Yosemite National Park map.

Mercer Creek (L); Fresno and San Benito counties; rises in the southwestern part of T. 13 S., R. 9 E.; flows southeastward 8 miles, then northeastward 10 miles to San Joaquin Valley; sinks below the foothills; carries water only during the rainy season; tributaries, Vasquez, Mill, and Salt creeks. Land Office map of California, 1907.

Merten Creek (R); rises in the southeastern part of T. 15 S., R. 30 E., Mount Diablo base and meridian, in Merten Meadow, at altitude 9,300 feet above sea level; flows west of south 3½ miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 5,000 feet. Tehipite sheet.

Milestone Creek (R); Tulare County; Sequoia National Forest; rises in the northeastern part of T. 15 S., R. 32 E., Mount Diablo base and meridian, on the eastern slope of the Great Western Divide, at altitude 12,200 feet above sea level; flows eastward 3 miles into Kern River; fall, 1,800 feet. Mount Whitney sheet.

Mill Creek (R); Amador County; rises in the south-central part of T. 8 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,700 feet above sea level; flows, in general, southwestward 7 miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 2,300 feet; principal tributary, Antelope Creek. Pyramid Peak, Big Trees and Jackson sheets.

Mill Creek (R); Calaveras County; rises in the northwestern part of T. 4 N., R. 15 E., Mount Diablo base and meridian, 1½ miles northwest of Avery, at altitude 3,500 feet above sea level; flows, in general, southeastward 3½ miles into North Fork of Stanislaus River (tributary through Middle Fork of Stanislaus to Stanislaus River and thus to the San Joaquin); fall, 1,800 feet, of which 800 feet is made in the last half mile; principal tributary, Moran Creek. Big Trees sheet.

Mill Creek (L); Fresno County; rises in the center of T. 9 S., R. 24 E., at altitude 5,000 feet above sea level; flows north of west about 3 miles into San Joaquin River above Italian Bar; fall, 3,500 feet; principal tributary, Jose Creek. Kaiser sheet.

Mill Creek (L); Fresno County; rises in the eastern part of T. 14 S., R. 27 E., Mount Diablo base and meridian; flows northwestward 24 miles into Kings River. Land Office map of southern California, 1907; Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Mill Creek (L); Fresno County; Sequoia National Forest; rises in the northeastern part of T. 14 S., R. 27 E., Mount Diablo base and meridian, in Sequoia Lake, at altitude 5,400 feet above sea level; flows northwestward into Kings River (tributary to San Joaquin River); length, 12 miles; fall, about 4,500 feet. J. N. LeConte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

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Mill Creek (R); Fresno County; rises in the central part of T. 6 S., R. 25 E., Mount Diablo base and meridian, at altitude 6,700 feet above sea level; flows southwestward 5 miles into San Joaquin River in the southeastern part of T. 6 S., R. 24 E.; fall, 3,600 feet. Kaiser sheet.

Mill Creek (L); Merced and Fresno counties; rises in the eastern part of T. 13 S., R. 9 E.; flows southeastward 7 miles into Mercer Creek (to San Joaquin Valley). Land Office map of California, 1907.

Mill Creek (L); Tuolumne County; Stanislaus National Forest; rises 2 miles northwest of Eagle Peak, at altitude 8,000 feet above sea level; flows northwestward 3½ miles, then south of west 3 miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 4,100 feet, of which 1,100 feet is made in the last mile of course. Dardanelles and Big Trees sheets.

Miller Lake; Tuolumne County; Yosemite National Park; southeastern part of T. 2 N., R. 23 E., Mount Diablo base and meridian; outlet, a stream 1 mile long, flowing southward to Return Creek (tributary through Tuolumne River to San Joaquin River); altitude, 9,550 feet; fall of outlet, 1,700 feet, of which 1,100 feet is in one-half mile just above Return Creek. Yosemite National Park map.

Mills Creek (R); Eldorado County; rises in the southern part of T. 10 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,700 feet above sea level; flows southwestward 2 miles to Squaw Hollow Creek through which it is tributary to Martinez Creek (tributary through North Fork of Cosumnes River and Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 600 feet. Placerville sheet.

Minaret Creek (R); Madera County; rises on the southeast slope of the Minarets and the southwest slope of Volcanic Ridge at altitude 10,050 feet above sea level; flows somewhat south of east about 4 miles to its junction with Middle Fork of San Joaquin River; fall, 2,300 feet; tributaries, numerous but unnamed; basin contains several unnamed lakes. Mount Lyell sheet.

Misery Creek (L); Amador County; rises in the northern part of T. 7 N., R. 13 E., Mount Diablo base and meridian, on the north slope of Mount Crossman, at altitude 3,700 feet above sea level; flows southwestward 5½ miles into Sutter Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin); fall, 1,400 feet; principal tributary, Pioneer Creek Jackson sheet.

Moccasin Creek (L); Tuolumne County; rises in the central part of T. 2 S., R. 16 E., Mount Diablo base and meridian, at altitude 2,500 feet above sea level; flows northwestward 10 miles into Tuolumne River (tributary to San Joaquin River); fall, 1,600 feet; principal tributaries, Cobbs and Rattlesnake creeks. Sonora sheet.

Moco Canyon Creek (L); Eldorado County; rises in the southeastern part of T. 9 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,100 feet above sea level; flows northwestward 2½ miles into Middle Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 600 feet. Placerville sheet.

Mokelumne River (R); formed by the union of its North and South Forks, in the eastern part of T. 6 N., R. 12 E., Mount Diablo base and meridian; the North Fork, which drains the larger area and is here considered the continuation of the main stream, rises in Alpine County in the Stanislaus National Forest, in Highland Lake, just southeast of Folger Peak, at altitude 8,600 feet above sea level; flows, in general, northwestward about 14 miles, then southwestward 38 miles to the point at which it receives the South Fork; from this point the general course is southwestward to San Joaquin River, which it joins about 25 miles northwest of Stockton; throughout the greater part of its course it forms the boundary between Amador and Calaveras counties; length, about 140 miles, of which approximately 90 miles are in the mountains; principal tributaries, Middle and South forks, Jackson Creek, and Cosumnes River.

Mokelumne basin touches the Sierra divide, which separates it from the Walker River basin on the east for a distance of about 20 miles. The lower part is a rolling,

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hilly region, sloping toward the river from each side and having large areas of cultivated land; farther upstream the slopes increase and the river flows in a broad, shallow canyon that continues to deepen almost to the source of the main stream. Above the forks are many small lakes and valleys surrounded by peaks. Altitudes range from 200 feet in the foothills to 10,000 feet on the crest of the divide.

The middle stretches and higher elevations support a heavy growth of timber; the lower reaches are covered with grass, brush, and scattering oaks; all the upper part of the basin, comprising about 400 square miles, is included in national forests.

The mean annual precipitation ranges from 20 inches in the valley to 50 inches or more on the higher mountains, where most of it occurs as snow.

Attempts to utilize the stream for irrigation on a moderately large scale have, as a rule, been unsuccessful.

The streams have steep gradients and the minimum flow is sufficient to furnish considerable power for storage.

Surveys and data: Pyramid Peak, Markleeville, Big Trees, Jackson, and Lodi sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 216–217.

Gaging stations at Lone Star Mills (1878–1884), near Lodi (1895), at Electra (1901, 1903, 1904), at Clements (1904–1912).

Mokelumne River, Middle Fork (L); Calaveras County; rises in the northeastern part of T. 6 N., R. 16 E., Mount Diablo base and meridian, at altitude 7,000 feet above sea level; flows, in general, westward 26 miles to the North Fork of Mokelumne River, with which it unites to form Mokelumne River (tributary to the San Joaquin); fall, 5,800 feet; principal tributaries, North Fork of Middle Fork of Mokelumne and South Fork of Mokelumne. Gaging station near Westpoint (1911–12). Big Trees and Jackson sheets.

Mokelumne River, North Fork, Middle Fork of (R); Calaveras County; rises in the southeastern part of T. 7 N., R. 16 E., Mount Diablo base and meridian, at altitude 6,900 feet above sea level; flows westward 14 miles, then southwestward 4 miles into Middle Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 4,200 feet; principal tributaries, Hunter and Lion Creeks. Big Trees sheet.

Mokelumne River, South Fork (L); Calaveras County; rises in the north-central part of T. 6 N., R. 16 E., Mount Diablo base and meridian, at altitude 7,200 feet above sea level; flows southwestward 11 miles, then northwestward 13 miles into Middle Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 6,000 feet; principal tributary, Licking Fork. Gaging station near Railroad Flat (1911–12). Big Trees and Jackson sheets.

Monache Creek (L); Tulare County; Kern National Forest; rises on the western slope of the Sierra Nevada, 1½ miles south of Olancha Peak, at altitude 9,700 feet above sea level; flows southwestward 3 miles into South Fork of Kern River (tributary to Kern River) in Monache Meadows; fall, 1,700 feet. Olancha sheet.

Monarch Lakes; Tulare County; Sequoia National Forest; eastern part of T. 17 S., R. 31 E., Mount Diablo base and meridian, on the southwestern slope of Sawtooth Peak; two small, connected lakes, discharging by a stream flowing westward 2 miles to the East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); altitude, 10,500 feet above sea level. Kaweah sheet.

Mono Creek (R); Fresno County; rises in Sierra National Forest, on the southern slope of Mount Huntington (altitude, 12,393 feet); flows southwestward 18 miles to its junction with the South Fork of San Joaquin River; fall, 4,800 feet; tributaries, Hopkins Creek, North Fork, and Cold Creek, as well as numerous smaller streams, many of which drain lakes. Mount Goddard and Kaiser sheets.

Mono Creek, North Fork (R); Fresno County; rises in Sierra National Forest, on the south slope of Silver Divide, at altitude 11,500 feet above sea level; flows south-

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westward 5 miles into Mono Creek (tributary to South Fork of San Joaquin River); fall, 3,000 feet; a number of small lakes near head. Mount Goddard sheet.

Moody Creek (R); San Benito County; rises in the eastern part of T. 16 S., R. 9 E.; flows northward 6 miles to its junction with Panoche Creek at Llanada; carries water only during the rainy season. Land Office map of California, 1907.

Moore Creek (L); Calaveras County; Stanislaus National Forest; rises in the northeastern part of T. 7 N., R. 16 E., Mount Diablo base and meridian, at altitude 7,300 feet above sea level; flows north of west 6½ miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 3,800 feet. Big Trees sheet.

Moore Creek (R); Mariposa County; rises in the southern part of T. 1 S., R. 17 E., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows southeastward 6 miles into North Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 500 feet; intermittent. Sonora sheet.

Moorehouse Creek (R); Tulare County; Sequoia National Forest; rises in the west-central part of T. 20 S., R. 31 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southwestward 2 miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule to Tule River and thus to the Tulare Lake basin); fall, 1,800 feet. Kaweah sheet.

Moose Lake; Tulare County; Sequoia National Forest; western part of T. 15 S., R. 31 E., Mount Diablo base and meridian; outlet, Buck Canyon Creek to Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); altitude, 10,550 feet. Tehipite sheet.

Moraine Creek (R); Tulare County; rises in the northwestern part of T. 14 S., R. 32 E., on the western slope of Silliman Crest, at altitude about 10,700 feet above sea level; flows irregularly northwestward 5 miles into Roaring River (tributary to South Fork of Kings River); fall, 3,700 feet. Tehipite sheet.

Moraine Lake; Tulare County; Sequoia National Forest; northeastern part of T. 17 S., R. 32 E., Mount Diablo base and meridian; outlet, Funston Creek to Kern River; altitude, 9,440 feet; one-half mile long; one-eighth mile wide. Olancha sheet.

Moran Creek (L); Calaveras County; rises in the northern part of T. 5 N., R. 15 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; flows, in general, southwestward 5 miles into Mill Creek (tributary through North Fork of Stanislaus River to Middle Fork of Stanislaus River and thus to the San Joaquin); fall, 1,200 feet; principal tributary, Love Creek. Big Trees sheet.

Mormon Creek (L); Tuolumne County; rises in the northeastern part of T. 2 N., R. 14 E., Mount Diablo base and meridian, 1 mile northeast of Columbia, at altitude 2,250 feet above sea level; flows, in general, southwestward 12 miles to its junction with Stanislaus River (tributary to the San Joaquin); fall, about 1,700 feet. Big Trees and Sonora sheets; Land Office map of California, 1907.

Morrison Creek (L); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 1 N., R. 22 E., Mount Diablo base and meridian, on the south slope of Double Rock, at altitude 9,300 feet; takes a circuitous and in general northwesterly course to its junction with Tuolumne River (tributary to the San Joaquin); length, 4½ miles; fall, 5,100 feet, of which 3,400 feet is made in the last 1¼ miles of its course. Yosemite National Park map.

Mosquito Lakes; Tulare County; Sequoia National Forest; central part of T. 17 S., R. 31 E., Mount Diablo base and meridian; a group of five small lakes, connected by short streams and discharging by a stream 2 miles long flowing northward to East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); the highest of these lakes is 9,900 feet above sea level; the lowest, which is 1 mile farther north, is nearly 9,000 feet above. Kaweah sheet.

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Moss Creek (R); Mariposa County; rises in the eastern part of T. 2 S., R. 19 E., in the Merced Grove of big trees, at altitude 5,500 feet above sea level; flows somewhat east of south 6 miles to its junction with Merced River (tributary to San Joaquin River) at Moss Canyon station on the Yosemite Valley Railroad; fall, 4,200 feet. Yosemite National Park map.

Mountaineer Creek (R); Tulare County; Sequoia National Forest; rises in the southeastern part of T. 19 S., R. 31 E., Mount Diablo base and meridian, at 8,000 feet above sea level; flows south of east 3 miles, then somewhat north of east 2 miles into Little Kern River (tributary to Kern River); fall, 1,900 feet. Kaweah sheet.

Mountain Spring Creek (L); Amador County; rises in the southeastern part of T. 6 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows westward 4 miles into Sutter Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin); fall, 800 feet. Jackson sheet.

Mud Lakes; Amador County; Stanislaus National Forest; eastern part of T. 9 N., R. 16 E., Mount Diablo base and meridian; no outlet shown on the map, but the contours indicate possible overflow northward to Tragedy Creek (tributary through Bear River to North Fork of Mokelumne River and thus to the San Joaquin); three small lakes in the marsh 8,000 feet above sea level. Pyramid Peak sheet.

Muddy Creek (L); Kern County; rises in the San Emigdio Grant, at altitude 2,500 feet above sea level; flows northward toward Buena Vista Lake Reservoir in San Joaquin Valley; intermittent. Mount Pinos sheet.

Mugler Creek (R); Madera County; rises in the central part of T. 5 S., R. 23 E., Mount Diablo base and meridian, at altitude 7,600 feet above sea level; flows southeastward 5 miles, passing through Mugler Meadow to junction with Chiquito Creek (tributary to San Joaquin River), in the northwestern part of T. 6 S., R. 24 E.; fall, 2,600 feet. Kaiser sheet.

Mule Creek (R); Amador County; rises in the northwestern part of T. 6 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,100 feet above sea level; flows in general southwestward into Sutter Creek (tributary through Dry Creek to Mokelumne River and thus to the San Joaquin); length, 9½ miles; fall, 1,200 feet. Jackson sheet.

Mule Gulch Creek (L); rises in the central part of T. 8 S., R. 7 E.; flows in general southeastward into Garzos Creek; length, 3 miles; carries water only during the rainy season. Orestimba-Panoche-Cantua special map.

Mulkey Creek (L); Tulare County; Kern National Forest; rises in the southeastern part of T. 17 S., R. 35 E., Mount Diablo base and meridian, 2½ miles southeast of Trail Peak, at altitude 9,500 feet above sea level; flows south of west 3½ miles, then southward 5 miles into South Fork of Kern River (tributary to Kern River); fall, 900 feet. Olancha sheet.

Muriel Lake; Fresno County; Sierra National Forest, 1 mile southwest of Piute Pass (altitude 11,409 feet); inlets, several streams draining glacial lakes; outlet, a stream one-half mile long, flowing northwestward to Piute Creek (tributary to South Fork of San Joaquin River); elevation 11,327 feet; fall of outlet about 300 feet. Mount Goddard sheet.

Murphy Creek (R); Mariposa County; Yosemite National Park, rises in a small lake north of Polly Dome at altitude 8,800 feet above sea level; flows southward 2 miles into Tenaya Lake (tributary through Merced River and thus to the San Joaquin); fall, 700 feet. Yosemite National Park map.

Neall Lake; Tuolumne County; Yosemite National Park, southeastern part of T. 2 N., R. 22 E., Mount Diablo base and meridian; two small inlets; outlet connected northward by a very short channel with Rodgers Canyon Creek (tributary to Tuolumne River); altitude, 9,250 feet. Yosemite National Park map.

Ned Gulch Creek (R); Mariposa County; rises in the central part of T. 2 S., R. 19 E., Mount Diablo base and meridian, at 5,800 feet above sea level; flows southward 3

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miles, then southwestward 4 miles into Merced River (tributary to the San Joaquin River); fall, 4,300 feet; principal tributary, Little Grizzly Creek. Yosemite sheet.

Nelder Creek (L); rises in the northern part of T. 6 S., R. 22 E., at altitude about 5,500 feet above sea level; flows southwestward about 6 miles to its junction with Lewis Fork of Fresno River (tributary through Fresno River to the San Joaquin); fall, about 2,500 feet; principal tributary Alder Creek; gaging station near Fresno Flats (1910–1912). Mariposa sheet.

Nellie Lake; Fresno County; southern part of T. 7 S., R. 25 E., south of Kaiser Crest; outlet, Home Camp Creek to Big Creek (tributary to San Joaquin River); altitude, 8,850 feet; fall of outlet, 2,000 feet. Kaiser sheet.

Nelson Creek (R); Tulare County; Sequoia National Forest; rises in the south central part of T. 20 S., R. 31 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows southward 2 miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule River to Tule River and thus to Tulare Lake basin); fall, 2,000 feet. Kaweah sheet.

Niagara Creek (L); Tuolumne County; Stanislaus National Forest; rises on the north slope of Eagle Peak, 1 mile west of Eagle Meadow, at altitude 8,200 feet above sea level; flows northwestward 6 miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); fall, 3,400 feet, of which 1,300 feet occurs in the last three-fourths mile of its course. Dardanelles sheet.

Ninemile Creek; Tulare County; Kern National Forest; rises in the western part of T. 19 S., R. 35 E., Mount Diablo base and meridian, at altitude 9,050 feet above sea level; flows southward in Long Canyon, then very irregularly westward 7 miles into Kern River; fall, 3,700 feet; principal tributary, Redrock Creek. Olancha sheet.

North Fork or **Branch**. See name of main stream.

North Goddard Creek. See *Goddard Creek, North*.

North Guard Creek. See *Guard Creek, North*.

Oak Gulch Creek (L); Stanislaus County; rises in the northwestern part of T. 8 S., R. 7 E.; flows, in general, southeastward into Garzos Creek just below the mouth of Mule Gulch Creek; carries water only during the rainy season. Orestimba-Panoche-Cantua special map.

Oliver Creek (L); Mariposa County; rises in the central part of T. 5 S., R. 20 E., at altitude 4,700 feet above sea level; flows southwestward 4 miles into De Long Creek (tributary through East Fork of Chowchilla River to Chowchilla River and thus to the San Joaquin); fall, 2,100 feet. Mariposa sheet.

O'Neil Creek (L); Calaveras County; rises in the eastern part of T. 5 N., R. 14 E., Mount Diablo base and meridian, 2 miles north of west of Big Trees, at altitude 4,400 feet above sea level; flows southwestward 12 miles to the central part of T. 4 N., R. 13 E., where it unites with McKinneys Creek to form Calaveritas Creek (tributary to South Fork of Calaveras River and thus through Calaveras River to the San Joaquin); fall, 2,900 feet. Big Trees and Jackson sheets.

On It Creek (R); Eldorado County; rises in the central part of T. 8 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,200 feet above sea level; flows, in general, south of west 3 miles into South Fork of Cosumnes River (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 900 feet. Placerville sheet.

Onion Lake; Tuolumne County; Yosemite National Park, northern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, three-fourths mile south of Summit Lake and on the opposite side of the Divide; outlet, a stream 1 mile long, flowing southwestward into Return Creek (tributary through Tuolumne River to San Joaquin River); altitude, 10,450 feet; fall of outlet, 1,300 feet. Yosemite National Park map.

Orestimba Creek (L); Stanislaus County; rises in the northern part of T. 8 S., R. 5 E.; flows, in general, north of east to San Joaquin Valley into which it sinks west of Newman; carries water only during the rainy season. Orestimba-Panoche-Cantua special map.

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Oriole Lake; Tulare County; Sequoia National Park; north central part of T. 17 S., R. 30 E., Mount Diablo base and meridian; 1 mile east of head of Squirrel Creek; no outlet; it lies, however, in an area draining to the East Fork of Kaweah River (tributary to Kaweah River and thus to Tulare Lake basin); altitude, 5,600 feet above sea level; very small. Kaweah sheet.

Ortigalita Creek (L); Merced County; rises in the central part of T. 13 S., R. 9 E.; on the west slope of Ortigalita Peak; flows northeastward into San Joaquin Valley; sinks below the foothills; tributary, Pietro Azura Creek. Land Office map of California, 1907; Fisk and Johnson map.

Ostrander Lake; Mariposa County; Yosemite National Park, southern part of T. 3 S., R. 22 E., north of Horse Ridge; outlet to Bridalveil Creek (tributary through Merced River to San Joaquin River); altitude, 8,650 feet. Yosemite National Park map.

Ottoway Creek (R); Madera County; Yosemite National Park; rises on the west slope of Ottoway Peak at altitude 11,000 feet above sea level; flows south of west 2½ miles, then northwestward 4 miles into Illilouette Creek (tributary through Merced River to San Joaquin River); fall, 3,400 feet. Yosemite National Park map.

Ousel Creek (L); Tulare County; rises in the central part of T. 14 S., R. 32 E., on the north slope of Mount Brewer, altitude 13,577 feet; flows northeastward 2 miles to East Lake on East Creek (tributary through Bubbs Creek to South Fork of Kings River); fall, about 2,300 feet. Mount Whitney sheet.

Owl Creek (L); Mariposa County; rises in the eastern part of T. 5 S., R. 19 E., on Magoon Hill at altitude 3,000 feet above sea level; flows southwestward into West Fork of Chowchilla River (tributary through Chowchilla River to the San Joaquin); fall, about 1,000 feet. Mariposa sheet.

Owl Creek (L); Mariposa County; Sierra National Forest; rises in the northwestern part of T. 5 S., R. 20 E., Mount Diablo base and meridian, at altitude 3,900 feet above sea level; flows northward 2 miles into Devil Gulch Creek (tributary through South Fork of Merced River to Merced River and thus to the San Joaquin); fall, 1,300 feet. Yosemite sheet.

Pacific Creek (L); Alpine County; Stanislaus National Forest; rises on the west slope of Henry Peak; altitude 9,309 feet; flows northward 4 miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 1,500 feet. Dardanelles and Markleville sheets.

Packsaddle Canyon Creek (L); Tulare County; Sierra National Forest; rises in the western part of T. 23 S., R. 33 E., Mount Diablo base and meridian, at altitude 5,500 feet above sea level; flows westward 2 miles into Kern River; fall, 1,900 feet. Kernville sheet.

Palisade Creek (L); Fresno County; Sierra National Forest; rises on the western slope of the Palisades, at altitude about 13,500 feet above sea level; flows, in general, westward to its junction with the Middle Fork of Kings River (tributary through Kings River to the San Joaquin); length, about 7 miles; fall, 6,400 feet; principal tributaries, Glacier and Cataract creeks, and a stream from Palisade basin. Mount Goddard sheet.

Palo Prieta Creek, East; rises in the eastern part of T. 28 S., R. 18 E.; flows northwestward 6 miles, then north of east toward Tulare Lake basin, in San Joaquin Valley; intermittent; sinks below the foothills. Manuscript map of San Joaquin Valley, Fisk and Johnson.

Panoche Creek (L); San Benito and Fresno counties; rises in the western part of T. 15 S., R. 9 E.; flows irregularly eastward to San Joaquin Valley; sinks below the foothills; carries water only during the rainy season; principal tributaries, Moody, Los Agitos, and Silver creeks. Land Office map of California, 1907; Fisk and Johnson map.

Panther Creek (R); Amador County; rises in the western part of T. 8 N., R. 15 E., Mount Diablo base and meridian, at altitude 6,100 feet above sea level; flows south-

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westward 7½ miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 3,300 feet; principal tributary, East Panther Creek. Pyramid Peak and Big Trees sheets.

Panther Creek (R); Tulare County; Sequoia National Park; rises in the southern part of T. 15 S., R. 30 E., Mount Diablo base and meridian, on the southeastern slope of Panther Peak, at altitude 7,500 feet above sea level; flows southward 3 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin), fall, 3,700 feet. Tehipite sheet.

Panther Creek, East (L); Amador County; rises in the central part of T. 8 N., R. 15 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows southwestward 7 miles into Panther Creek (tributary through North Fork of Mokelumne River to Mokelumne River, and thus to the San Joaquin); fall, 3,100 feet. Pyramid Peak and Big Trees sheets.

Paradise Creek (L); Tulare County; rises in the northern part of T. 17 S., R. 30 E., Mount Diablo base and meridian, at altitude 7,500 feet above sea level; flows northwestward 5 miles into Middle Fork of Kaweah River (tributary through Kaweah River to Tulare Lake Basin); fall, 4,700 feet. Kaweah and Tehipite sheets.

Pastoria Creek; Kern County; rises on the northern slope of the Tehachapi Mountains at altitude 5,300 feet above sea level; flows southwestward 7 miles, then northwestward 8 miles toward Buena Vista Reservoir; intermittent; fall above the border of San Joaquin Valley, about 4,000 feet. Tejon sheet.

Peckinpah Creek (L); Madera County; rises in the northern part of T. 8 S., R. 23 E., at Peckinpah Mill, at altitude 5,600 feet above sea level; flows southwestward 3 miles into South Fork of Little North Fork of San Joaquin River, one-half mile above South Fork settlement; fall, 3,000 feet. Kaiser sheet.

Pecks Canyon Creek (L); Tulare County; Sequoia National Forest; rises in the northern part of T. 19 S., R. 31 E., Mount Diablo base and meridian, south of Sheep Mountain, at 9,500 feet above sea level; flows southeastward 5 miles into Alpine Creek (tributary through Kern River to Little Kern River); fall, 2,700 feet. Kaweah sheet.

Peppermint Creek (R); Tulare County; Sequoia National Forest; rises in the western part of T. 21 S., R. 32 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows, in general, southeastward 7 miles into Kern River; fall, 4,200 feet. Kaweah and Olancha sheets.

Peppermint Creek (R); Tuolumne County; rises near Shaws Flat, 2 miles northwest of Sonora, at altitude 2,100 feet; flows, in general, southward to its junction with Woods Creek (tributary through Tuolumne River to San Joaquin River) at Jamestown; fall, 600 feet; intermittent. Sonora sheet.

Perrin Creek (R); Tulare County; Sequoia National Forest; rises 2 miles southwest of Whitney Pass at altitude 11,650 feet above sea level; flows southwestward 2½ miles into Rock Creek (tributary to Kern River); fall, 2,000 feet. Mount Whitney and Olancha sheets.

Perry Creek (L); Eldorado County; rises in the northwestern part of T. 8 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,500 feet above sea level; flows westward 2½ miles, then, in general, northwestward 5 miles into Middle Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,800 feet. Placerville sheet.

Peterson Creek (R); Mariposa and Madera counties; rises in the northwestern part of T. 6 S., R. 21 E., on Pilot Peak (altitude 5,260 feet); flows southward 4½ miles to its junction with North Fork of Fresno River (tributary to Fresno River and thus to the San Joaquin); fall, about 1,300 feet. Mariposa sheet.

Picayune Creek (L); Madera County; rises in the central part of T. 8 S., R. 21 E., Mount Diablo base and meridian, at altitude 2,400 feet above sea level; flows south of west 2½ miles into Coarse Gold Creek (tributary through Fresno River to the San Joaquin); fall, 600 feet. Mariposa sheet.

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Pickett Creek (R); Tulare County; Sequoia National Forest; rises in the northern part of T. 16 S., R. 32 E., Mount Diablo base and meridian, on the north slope of Kaweah Peaks, at altitude 12,400 feet above sea level; flows north of east 4 miles into Kern-Kaweah River (tributary to Kern River just above Rockslide Lake); fall, 2,700 feet. Tehipite and Mount Whitney sheets.

Pierce Creek (R); Tulare County; Sequoia National Forest; rises in the southern part of T. 14 S., R. 28 E., Mount Diablo base and meridian, on the west slope of Redwood Mountain, at altitude 6,000 feet above sea level; flows southward 6 miles into North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,300 feet. Tehipite sheet.

Pietra Azura Creek (L); Merced County; rises in the northern part of T. 13 S., R. 9 E.; flows northeastward into Ortigalita Creek (to San Joaquin Valley); length, 7 miles; carries water only in rainy season. Land Office map of California, 1907.

Pigeon Creek (R); Amador County; rises in the northern part of T. 8 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,000 feet above sea level; flows irregularly westward 6 miles into Big Indian Creek (tributary through Cosumnes River to the Mokelumne and thus to the San Joaquin); fall, 1,100 feet. Placerville sheet.

Pigeon Creek (R); Tulare County; Sequoia National Forest; rises in the western part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 5,500 feet above sea level; flows southwestward 5 miles into South Fork of Tule River (tributary through Tule River to Tulare Lake basin); in the Tule River Indian Reservation; fall, 4,000 feet. Kaweah sheet.

Piney Creek (R); Mariposa County; rises in the southwestern part of T. 2 S., R. 15 E., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows southward 6 miles into Merced River (tributary to San Joaquin River) in Pleasant Valley; fall, 600 feet; intermittent. Sonora sheet.

Pinyon Creek (R); Kern County; Sierra National Forest; rises in the western part of T. 27 S., R. 36 E., Mount Diablo base and meridian, at altitude 5,500 feet above sea level; flows somewhat south of west 4 miles into Kelso Creek (tributary to South Fork of Kern River); fall, 1,500 feet; intermittent. Kernville sheet.

Pioneer Creek (L); rises in the central part of T. 7 N., R. 13 E., Mount Diablo base and meridian, on the south slope of Mount Crossman, at altitude 3,500 feet above sea level; flows very irregularly westward 4 miles into Misery Creek (tributary through Sutter Creek to Dry Creek and thus through Mokelumne River to the San Joaquin); fall, 1,000 feet. Jackson sheet.

Pitman Creek (R); Fresno County; formed in the southeastern part of T. 8 S., R. 25 E., by the junction of South Fork and Tamarack Creek; flows northwestward 2 miles into Big Creek (tributary to San Joaquin River); fall below mouth of Tamarack Creek, 2,200 feet. Kaiser sheet.

Piute Creek (R); Fresno County; rises in Sierra National Forest, in a number of small lakes on the south slope of Mount Humphreys (elevation 13,972 feet;) flows southwestward 2 miles, northwestward 5 miles, to the foot of Pilot Knob, then southwestward about 5 miles to its junction with South Fork of San Joaquin River (head of San Joaquin); fall, 3,700 feet; tributaries, numerous short streams flowing from glacial lakes. The largest lake in the area is Desolation Lake, in the Humphreys Basin; the tributaries from the south flow from Glacier Divide and practically all head in living glaciers. Mount Goddard sheet.

Piute Creek (R); Tuolumne County; Yosemite National Park; rises in the east-central part of T. 3 N., R. 23 E., Mount Diablo base and meridian, on the south slope of Kettle Peak at altitude 9,900 feet above sea level; flows southwestward 15 miles to its junction with Tuolumne River (tributary to San Joaquin River) in Pate Valley; fall, 5,400 feet; principal tributaries, Big Meadow and Rock Canyon creeks; upper course of the creek is through Slide Canyon; many small lakes in upper part of basin Yosemite National Park map.

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Pleito Creek (L); Kern County; rises in the eastern part of T. 9 N., R. 21 W., San Bernardino base and meridian; flows, in general, northward toward Buena Vista reservoir, in San Joaquin Valley; intermittent. Mount Pinos sheet.

Polvadero Creek (L); Fresno County; rises in the northern part of T. 24 S., R. 15 E.; flows northeastward 18 miles into San Joaquin Valley; sinks before reaching Los Gatos Creek, to which its basin is topographically tributary; called Zapatos Creek in the upper part of its course. Fisk and Johnson map.

Poso Creek (R); rises in the northern part of T. 27 S., R. 31 E., Mount Diablo base and meridian, in the Sierra foothills; flows westward into San Joaquin Valley; carries water for several months each year; drainage area about 289 square miles; water is held for irrigation. Gaging station at base of foothills (1878–1884). Land Office map of California, 1907.

Post Creek (L); Madera County; rises in the Sierra National Forest, on the west slope of Post Peak, 2 miles east of Triple Divide Peak, at altitude 10,200 feet above sea level; flows southeasterly 3 miles into West Fork of Granite Creek (tributary through Granite Creek to Middle Fork of San Joaquin River); fall, 1,900 feet. Mount Lyell sheet.

Post Corral Creek (R); Fresno County; Sierra National Forest; rises 1 mile north of the north line of T. 9 S., R. 28 E., Mount Diablo base and meridian, at altitude 10,300 feet above sea level; flows southward 8 miles into North Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 2,700 feet; principal tributary, Burnt Corral Creek. Mount Goddard sheet.

Quartz Creek (L); Madera County; Sierra National Forest; rises in the northern part of T. 5 S., R. 23 E., at altitude 8,200 feet; flows northwestward 3 miles along the west base of Quartz Mountain into South Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 1,400 feet. Yosemite National Park map.

Quinto Creek (L); Stanislaus and Merced counties; rises in the southeastern part of T. 8 S., R. 6 E.; flows south of east to San Joaquin Valley; length, 12 miles. Called Rinto on Land Office map, 1907.

Rabbit Creek (L); Amador County; rises in the southeastern part of T. 5 N., R. 9 E., at altitude 400 feet above sea level; flows southwestward 4 miles into Mokelumne River (tributary to the San Joaquin); fall, 250 feet. Jackson sheet.

Rae Lake; Fresno County; Sierra National Forest, 1 mile north of Mount Rixford; several inflowing streams draining small lakes; outlet, South Fork of Woods Creek through Woods Creek to South Fork of Kings River (tributary to the San Joaquin) altitude 10,560 feet. Mount Whitney sheet.

Rafferty Creek (L); Tuolumne County; Yosemite National Park; rises on the east slope of Rafferty Peak (altitude, 11,178 feet); flows northeastward 2 miles, then northward 2 miles into Lyell Fork of Tuolumne River (tributary through Tuolumne River to San Joaquin River); fall, 1,400 feet; principal tributary, stream from Evelyn Lake. Yosemite National Park map.

Rambaud Creek (R); Fresno County; Sierra National Forest; rises in a group of small lakes east of Black Divide at altitude 11,000 feet above sea level; flows eastward 2 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 2,400 feet. Mount Goddard sheet.

Rancheria Creek (L); Amador County; rises in the central part of T. 7 N., R. 12 E., Mount Diablo base and meridian, at altitude 2,950 feet above sea level; flows south of west 14 miles into Dry Creek (tributary through Mokelumne River to San Joaquin River); fall, 2,300 feet; principal tributary, Amador Creek. Jackson sheet.

Rancheria Creek (L); Fresno County; Sierra National Forest; rises in the eastern part of T. 11 S., R. 28 E., Mount Diablo base and meridian; on the west slope of Crown Mountain, at altitude 9,000 feet above sea level; flows, in general, westward 11 miles into North Fork of Kings River (tributary through Kings River to the San Joaquin); fall, about 6,000 feet; principal tributaries, Statum Creek and North Fork. Tehipite sheet.

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Rancheria Creek (R); Tulare County; Sequoia National Forest; rises in the south-central part of T. 19 S., R. 30 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows, in general, southwestward 5 miles into Bear Creek (tributary through North Fork of Tule River to Tule River and thus to Tulare Lake basin); fall, 4,000 feet. Kaweah sheet.

Rancheria Creek (R); Tuolumne County; Yosemite National Park; rises in the northwestern part of T. 3 N., R. 23 E., Mount Diablo base and meridian, in Kerrick Meadow, at altitude 9,500 feet above sea level; flows southwestward 22 miles to its junction with Tuolumne River (tributary to the San Joaquin) at the upper end of Hetch Hetchy Valley; fall, 3,800 feet; principal tributaries, Stubblefield Canyon, Tilden Canyon, Deep Canyon, and Tiltill creeks; upper course of the creek lies through Kerrick Canyon. Yosemite National Park map.

Rancheria Creek, North Fork (R); Fresno County; Sierra National Forest; rises in the northeastern part of T. 11 S., R. 28 E., Mount Diablo base and meridian, at altitude 9,800 feet above sea level; flows, in general, southwestward 5 miles into Rancheria Creek (tributary through North Fork of Kings River to Kings River and thus to the San Joaquin); fall above the junction with Rancheria Creek, 2,500 feet. Tehipite sheet.

Rattlesnake Creek (R); Fresno County; Sierra National Forest; rises in the northwestern part of T. 11 S., R. 30 E., Mount Diablo base and meridian, in Grouse Meadow, at altitude 10,000 feet above sea level; flows southward 3 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 4,800 feet, of which 2,800 feet is made in the last mile. Tehipite sheet.

Rattlesnake Creek (L); Fresno and Tulare counties; rises in the southern part of T. 14 S., R. 27 E.; takes a general southerly course into San Joaquin Valley; length above the valley, 18 miles; sinks south of Yettem. Land Office map, 1907.

Rattlesnake Creek (R); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 17 S., R. 32 E., Mount Diablo base and meridian, on the eastern slope of the Great Western Divide, at altitude 11,000 feet above sea level; flows eastward 4 miles, then northeastward 3½ miles into Kern River, 1 mile above lower Funston Meadow; fall, 4,500 feet. Kaweah and Olancha sheets.

Rattlesnake Creek (L); Tulare County; Kern National Forest; rises in the central part of T. 22 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,400 feet above sea level; flows, in general, northwestward 12 miles into Kern River; fall, 3,500 feet; principal tributaries, Bonita and Smith creeks. Olancha sheet.

Rattlesnake Creek (R); Tuolumne County; rises in the western part of T. 1 S., R. 16 E., Mount Diablo base and meridian, near Bigoak Flat, at altitude 3,100 feet; flows southwestward 1½ miles, then southward 2½ miles into Moccasin Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,500 feet; intermittent. Sonora sheet.

Rattlesnake Lake; Madera County; Sierra National Forest, in Cassidy Meadow; no inlet mapped; outlet, a stream 1½ miles long flowing southward to South Fork of San Joaquin River (head of San Joaquin); elevation, 5,583 feet; fall of outlet, 1,383 feet. Kaiser sheet.

Red Creek (L); Madera and Mariposa counties; Yosemite National Park; rises on the northern slope of Red Peak (altitude, 11,700 feet); flows northwestward 3 miles into Gray Creek (tributary through Clark Fork and Ottoway Creek to Illilouette Creek and thus through Merced River to the San Joaquin); fall, 2,800 feet. Yosemite National Park map.

Red Peak Fork (L); rises in Madera County, on the north slope of Red Peak, 1½ miles northwest of Merced Peak, at altitude 11,500 feet above sea level; flows northeastward 4 miles into Merced River (tributary to the San Joaquin); one-half mile above Washburn Lake; fall, 3,300 feet, of which 1,000 feet occurs in the first mile and 1,200 feet in the last mile of its course. Mount Lyell sheet.

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Red Spur Creek (R); Tulare County; Sequoia National Forest; rises in the eastern part of T. 16 S., R. 32 E., Mount Diablo base and meridian, on the south slope of Red Spur, at altitude 11,700 feet above sea level; flows southeastward 3½ miles into Kern River; fall, 4,500 feet. Mount Whitney sheet.

Redrock Creek (R); Tulare County; Kern National Forest; rises in Redrock Meadows, at altitude 8,900 feet above sea level; flows southwestward 4½ miles into Ninemile Creek (tributary to Kern River) near Jordan Hot Springs; fall, 2,400 feet. Olancha sheet.

Reds Creek (L); Madera County; rises in eastern part of the Sierra National Forest, in a small lake near the summit of the divide, at altitude 9,550 feet above sea level; flows southwestward 2 miles, then southward 1 mile through Sotcher Lake, then very irregularly westward to its junction with the Middle Fork of San Joaquin River in Reds Meadows; fall, about 2,000 feet; the basin contains a number of mineral springs, including Soda Springs, one-half mile west of the north end of Sotcher Lake, and Hot Sulphur Spring, one-half mile south of Sotcher Lake. Mount Lyell sheet.

Redwood Creek (L); Fresno County; Sequoia National Forest; rises in the northwestern part of T. 13 S., R. 29 E., Mount Diablo base and meridian, on the eastern slope of Sequoia Ridge, at altitude 6,700 feet above sea level; flows northward into South Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 4,000 feet. Tehipite sheet.

Redwood Creek (R); Tulare County; Sequoia National Forest; rises in the north central part of T. 14 S., R. 28 E., Mount Diablo base and meridian, on the north slope of Redwood Mountain, at altitude 6,500 feet above sea level; flows east of south 7 miles into North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 2,900 feet; principal tributary, East Fork. Tehipite sheet.

Redwood Creek (R); Tulare County; Sequoia National Park; rises in the northeastern part of T. 17 S., R. 30 E., at altitude 7,500 feet above sea level; flows southward 1½ miles into East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,000 feet; intermittent. Kaweah sheet.

Redwood Creek, East Fork (L); Tulare County; Sequoia National Forest; rises in the eastern part of T. 14 S., R. 28 E., Mount Diablo base and meridian, on the north slope of Big Baldy Ridge, at altitude 7,300 feet above sea level; flows southwestward 2½ miles into Redwood Creek (tributary through North Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 1,900 feet. Tehipite sheet.

Reed Creek (L); Tuolumne County; Stanislaus National Forest; rises in the central part of T. 3 N., R. 19 E., at altitude 7,600 feet above sea level; flows southwestward 15 miles into Clavey River (tributary through Tuolumne River to the San Joaquin); fall, 4,500 feet; principal tributaries, Reynolds and Jawbone creeks. Dardanelles, Big Trees, and Sonora sheets.

Reflection Lake; Tulare County; Sierra National Forest, north of Kings-Kern divide; principal inlet, East Creek; outlet, East Creek to Bubbs Creek (tributary to South Fork of Kings River); altitude, 10,168 feet; fall of outlet, 1,700 feet. Mount Whitney sheet.

Register Creek (R); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 2 N., R. 23 E., Mount Diablo base and meridian, at altitude 10,200 feet above sea level; flows southward 2 miles, southwestward 1½ miles, then almost directly south 1 mile to its junction with Tuolumne River (tributary to San Joaquin River); fall, 4,700 feet, of which 3,000 feet occurs in the mile above its entrance to the San Joaquin. Yosemite National Park map.

Relief Creek (L); Tuolumne County; rises in the northern part of T. 4 N., R. 21 E., Mount Diablo base and meridian, 2 miles southeast of Relief Peak, at altitude 10,000 feet above sea level; flows, in general, northwestward 10 miles to the northeastern part of T. 5 N., R. 20 E., where it unites with Dead Man Creek to form Middle Fork of Stanislaus River (tributary to San Joaquin River); fall, above junction with Dead

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Man Creek, 3,700 feet; principal tributaries, Grouse Creek and East Fork; shorter tributaries drain the north slope of Granite Dome and Relief Valley. Dardanelles sheet.

Relief Creek, East Fork (R); Tuolumne County; rises in the southeastern part of T. 5 N., R. 21 E., Mount Diablo base and meridian, at altitude 9,600 feet above sea level; flows northwestward 7½ miles, passing through Kennedy Lake into Relief Creek (tributary through Middle Fork of Stanislaus River to Stanislaus River and thus to the San Joaquin); fall, 2,600 feet, of which 1,800 feet occurs in the 2½ miles above Kennedy Lake and 800 feet in the 3½ miles below the lake. Dardanelles sheet.

Return Creek (R); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 3 N., R. 24 E., Mount Diablo base and meridian, in a glacial lakelet on the north slope of Red Peak (altitude, 11,959 feet); flows southward 2 miles, then takes a general southwesterly course to its junction with the Tuolumne (tributary to San Joaquin River) in the western part of T. 1 N., R. 23 E.; length, 14 miles; fall, 5,000 feet; enters the Tuolumne through a deep canyon; basin contains many small glacial lakes; principal tributaries, East Fork, Spiller, and Matterhorn Canyon creeks. Yosemite National Park map.

Return Creek, East Fork (L); Tuolumne County; Yosemite National Park, rises in the south central part of T. 2 N., R. 24 E., Mount Diablo base and meridian, on the south slope of Shepherd Crest at altitude 10,100 feet above sea level; flows westward 3 miles into Return Creek (tributary through Tuolumne River to San Joaquin River); fall, 1,600 feet; principal tributary, a stream from McCabe Lake. Yosemite National Park map.

Return Creek, West Fork (R); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 2 N., R. 23 E., Mount Diablo base and meridian, at altitude 10,000 feet above sea level; flows southeastward 3 miles into Return Creek (tributary through Tuolumne River to San Joaquin River); fall, 2,500 feet; principal tributary, Matterhorn Canyon Creek. Yosemite National Park map.

Reynolds Creek (L); Tuolumne County; Stanislaus National Forest; rises near the central part of T. 3 N., R. 19 E., at altitude 7,200 feet above sea level; flows southwestward 8½ miles into Reed Creek (tributary through Clavey River to Tuolumne River and thus to the San Joaquin); fall, 2,200 feet. Dardanelles sheet.

Rifle Creek (L); Tulare County; Sequoia National Forest; rises in the central part of T. 18 S., R. 32 E., Mount Diablo base and meridian, at altitude 10,500 feet above sea level; flows west of south 3 miles into Little Kern River (tributary to Kern River); fall, 3,300 feet. Kaweah sheet.

Roaring River (L); rises in Tulare County, in the western part of T. 15 S., R. 32 E., on the northern slope of the Great Western Divide, just north of Triple Divide Peak (altitude, 12,657 feet); flows northward 5 miles, then, in general, northwestward 10 miles to its junction with the South Fork of Kings River in T. 13 S., R. 31 E.; fall, 5,400 feet; many branching tributaries. The basin is about 13 miles long north to south, and 14 miles in maximum width; it contains many broad, high, open meadows; on its eastern rim are many peaks exceeding 13,000 feet in altitude; its western rim is lower, Mount Silliman (11,188 feet) being the highest point. Tehipite sheet.

Rock Canyon Creek (R); Tuolumne County; Yosemite National Park, rises in the southwestern part of T. 3 N., R. 23 E., Mount Diablo base and meridian, on north slope of Suicide Ridge, at altitude 10,500 feet above sea level; flows southwestward through Rock Island Lake to Crazy Mule Gulch, through which it enters Piute Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,300 feet. Yosemite National Park map.

Rock Creek (R); Calaveras, Stanislaus, and San Joaquin counties; rises in the northwestern part of T. 2 N., R. 12 E., Mount Diablo base and meridian, on the western slope of Bear Mountain, at altitude 2,000 feet above sea level; flows southwestward, passing through the reservoir in Salt Spring Valley and discharges into French Camp

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Creek (tributary to San Joaquin River) in the southeastern part of T. 1 N., R. 9 E.; length, about 18 miles; fall, about 1,900 feet. Jackson sheet. Land Office map of California, 1907.

Rock Creek (R); Fresno County; Sierra National Forest; rises in the western part of T. 9 S., R. 26 E., Mount Diablo base and meridian, in Cuts Meadow, at altitude 7,500 feet above sea level; flows southward 3 miles into Dinkey Creek (tributary to North Fork of Kings River and thus through Kings River to the San Joaquin); fall, 1,100 feet. Kaiser sheet.

Rock Creek (R); Fresno County; rises in a small lake 1 mile east of Pincushion Peak, at altitude 9,300 feet above sea level; flows irregularly southward 5 miles into Four Forks Creek (tributary to South Fork San Joaquin River, head of San Joaquin); fall, 3,200 feet. Kaiser sheet.

Rock Creek (R); Madera County; rises in the north-central part of T. 7 S., R. 23 E., in Brown Meadow, at altitude 6,500 feet above sea level; flows southeastward about 8 miles to its junction with the San Joaquin, in the southern part of T. 7 S., R. 24 E.; fall, 3,800 feet. Kaiser sheet.

Rock Creek (L); Tulare County; Sequoia National Forest; rises in small lakes in glacial cirques south of Whitney Pass and west of Mount Le Conte; flows southwestward 3 miles, then irregularly westward 7 miles to its junction with Kern River; fall from the highest of the lakes to a point at which the creek enters Kern River 5,200 feet; principal tributaries, Perrin and Guiot creeks and South Fork of Rock Creek. Mount Whitney and Olancha sheets.

Rock Creek, South Fork (L); rises in the northern part of T. 17 S., R. 34 E., Mount Diablo base and meridian, 2 miles north of Whitney Meadows, at altitude 10,900 feet above sea level; flows west and northwest 4½ miles into Rock Creek (tributary to Kern River); fall, 14,000 feet. Olancha sheet.

Rock Island Lake; Tuolumne County; Yosemite National Park, southwestern part of T. 3 N., R. 23 E., Mount Diablo base and meridian; inlet and outlet, Rock Canyon Creek (tributary through Crazy Mule Gulch to Piute Creek, and thus through Tuolumne River to the San Joaquin); altitude, 9,850 feet; the lake is nearly a mile long and one-eighth mile in maximum width; marshy at upper end. Yosemite National Park map.

Rocksalide Lake; Tulare County; Sequoia National Forest; southeastern part of T. 15 S., R. 32 E., on Kern-Kaweah River (tributary to Kern River) 1 mile above Junction Meadow; altitude, 9,100 feet. Mount Whitney sheet.

Rocky Basin Lakes; Tulare County; Sequoia National Forest; western part of T. 17 S., R. 34 E., Mount Diablo base and meridian; a group of four lakes, three without outlet and one discharging by a stream 3½ miles long flowing southeastward to Golden Trout Creek (tributary to Kern River); altitude of the highest lake, 10,850 feet; altitude of the lake discharging to Golden Trout Creek, 10,750 feet. Olancha sheet.

Rocky Creek (R); Tulare County; Sequoia National Forest; rises in the western part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southwestward 6 miles into South Fork of Tule River (tributary through Tule River to Tulare Lake basin) in the Tule Indian Reservation; fall, 4,600 feet. Kaweah sheet.

Rodgers Canyon Creek (R); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 2 N., R. 23 E., in Rodgers Lake, at altitude 9,500 feet above sea level; flows southwestward 5 miles into Tuolumne River (tributary to San Joaquin River); fall, 2,500 feet. Yosemite National Park map.

Rodgers Creek (R); Fresno County; Sierra National Forest; rises in the northeastern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, on Spanish Mountain (altitude 10,044 feet); flows northeastward 2 miles, then southeastward 2 miles into Crown Creek (tributary to Middle Fork of Kings River and thus through Kings River to the San Joaquin); fall, 3,000 feet. Tehipite sheet.

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Rodgers Lake; Tuolumne County; Yosemite National Park; southwestern part of T. 2 N., R. 23 E., Mount Diablo base and meridian; outlet, Rodgers Canyon Creek to Tuolumne River (tributary to San Joaquin River); altitude 9,500 feet. Yosemite National Park map.

Roger Creek (L); Tuolumne County; rises in the southern part of T. 3 S., R. 15 E., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows northwestward 4½ miles, then somewhat north of west 2 miles into the pond formed on Tuolumne River (tributary to the San Joaquin River) by the Lagrange dam; fall, about 800 feet; intermittent. Sonora sheet.

Romero Creek (L); Merced County; rises in the western part of T. 9 S., R. 7 E.; flows eastward to San Joaquin Valley; length, 12 miles; sinks below the foothills; carries water only during the rainy season. Land Office map of California, 1907; Fisk and Johnson map.

Rose Creek (L); Tuolumne County; rises in the southwestern part of T. 4 N., R. 17 E., Mount Diablo base and meridian, at altitude 4,900 feet above sea level; flows, in general, southwestward 7 miles and westward 7 miles into Stanislaus River (tributary to San Joaquin River); fall, 3,900 feet; principal tributaries, Knight and Eagle creeks. Gaging station near Jupiter (1910–1912). Big Trees sheet.

Rose Lake; Fresno County; Sierra National Forest, just northeast of Mount Hooper and 2 miles east of the east line of T. 7 S., R. 27 E., two small inlets; outlet, a stream three-fourths mile long, flowing northward to the stream connecting Marie Lake with the South Fork of Bear Creek (tributary to South Fork San Joaquin River); elevation, 10,672 feet; fall of outlet, 800 feet. Mount Goddard sheet.

Ross Creek (R); Madera County; rises in the southeastern corner of T. 7 S., R. 23 E., on the east slope of Whiskey Ridge, at altitude 6,000 feet above sea level; flows southeastward 5 miles to its junction with San Joaquin River, in the central part of T. 8 S., R. 24 E.; fall, 3,500 feet, of which 1,000 feet occurs in one-half mile at the mouth. Kaiser sheet.

Rough and Ready Creek (R); Tuolumne County; rises in the central part of T. 1 N., R. 15 E., Mount Diablo base and meridian, at altitude 2,700 feet above sea level; flows southwestward 4 miles, then southeastward 1 mile into Tuolumne Creek; fall, 1,700 feet; principal tributary, Blanket Creek; intermittent. Sonora sheet.

Rough Creek (R); Fresno County; Sierra National Forest; rises in the northern part of T. 12 S., R. 28 E., Mount Diablo base and meridian. on the northwest slope of Spanish Mountain, at altitude 9,500 feet, above sea level; flows, in general, southwestward 5½ miles into Kings River (tributary to San Joaquin River); fall, 7,700 feet. Tehipite sheet.

Rube Creek (R); Fresno County; rises in the Sierra National Forest, in Rube Meadow, at altitude 7,200 feet above sea level; flows west of south 3 miles into South Fork San Joaquin River (head of San Joaquin); fall, 3,200 feet, of which 1,500 feet occurs in less than a quarter of a mile at the mouth. Kaiser sheet.

Rush Creek (R); Fresno County; Sierra National Forest; rises in the northwestern part of T. 10 S., R. 25 E., Mount Diablo base and meridian; flows, in general, southeastward to its junction with Big Creek (tributary to Kings River and thus to the San Joaquin); length, 10 miles; principal tributary, Taylor Creek. Gaging station near Ockenden (1910–1912). Kaiser sheet; Land Office map of California, 1907; Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Rush Creek (L); Mariposa County; Sierra National Forest; rises in the northeastern part of T. 5 S., R. 20 E., on the east slope of Devil Peak; altitude, 7,079 feet; flows eastward 2 miles, then northeastward 1 mile into South Fork of Merced River (tributary through Merced River to the San Joaquin); fall, 2,500 feet. Yosemite sheet.

Rush Creek (L); Tuolumne County; Stanislaus National Forest; rises in the north-central part of T. 3 N., R. 18 E., at altitude 6,000 feet above sea level; flows southwest-

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ward 6 miles into Hull Creek (tributary through Clavey River to Tuolumne River and thus to the San Joaquin); fall, 700 feet; middle course marshy. Big Trees sheet.

Rutherford Lake; Madera County; Sierra National Forest, 1 mile northeast of Fernandez Pass; outlet, a stream about 1 mile long, flowing, in general, eastward to the west fork of Granite Creek (tributary through Granite Creek to Middle Fork of San Joaquin River); elevation, 9,700 feet; fall of outlet, about 300 feet. Mount Lyell sheet.

Sadlier Lake; Madera County; Sierra National Forest, 1 mile southeast of Isberg Peak and one-half mile east of McClure Lake; inlet, East Fork Granite Creek, which flows through it to its junction with West Fork Granite Creek (tributary to Middle Fork of San Joaquin) and streams from McClure and several smaller lakes; elevation, 9,350 feet. Mount Lyell sheet.

Salado Creek (L); Stanislaus County; rises in the southern part of T. 6 S., R. 6 E.; flows northeastward 5 miles, then eastward 5 miles, discharges into San Joaquin Valley; carries water only during the rainy season. Orestimba-Panoche-Cantua special map.

Salado Creek, Little (L); Stanislaus County; rises in the western part of T. 6 S., R. 7 E.; flows eastward into San Joaquin Valley; carries water only during the rainy season. Orestimba-Panoche-Cantua special map.

Salmon Creek (L); Tulare County; Sierra National Forest; rises in the west-central part of T. 24 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows, in general, northwestward 8 miles, then southwestward 2 miles into Kern River, passes through Big and Horse meadows; in Big Meadow receives a branch coming from the eastern slope of Sirretta Peak; fall, 4,600 feet, of which 1,000 feet is made at Salmon Falls 2 miles above the mouth. Kernville sheet.

Salt Creek (R); Fresno County; rises in the southwestern part of T. 18 S., R. 14 E.; flows northeastward 12 miles to its junction with Cantua Creek, near the center of T. 17 S., R. 15 E.; carries water only during the rainy season. Fisk and Johnson map.

Salt Creek (L); Kern County; rises in the western part of T. 9 N., R. 20 W., at altitude 5,500 feet above sea level; flows, in general, east of north toward Buena Vista Lake Reservoir in San Joaquin Valley; length, about 10 miles; intermittent. Mount Pinos and Tejon sheets.

Salt Creek (L); Merced and Fresno counties; rises in the northern part of T. 13 S., R. 10 E.; flows southeastward 6 miles to Mercer Creek (to San Joaquin Valley). Land Office map of California, 1907.

Salt Creek (L); Tulare County; Sequoia National Park; rises in the southeastern part of T. 17 S., R. 29 E., Mount Diablo base and meridian, on the north slope of Case Mountain, at altitude 5,500 feet above sea level; flows northwestward 5 miles into Kaweah River (tributary to Tulare Lake basin); fall, 4,500 feet; intermittent. Kaweah sheet.

Salt Gulch Creek (L); Calaveras County; rises in the southern part of T. 4 N., R. 11 E., Mount Diablo base and meridian, at altitude 800 feet above sea level; flows northwestward 3 miles into Mokelumne River (tributary to San Joaquin River); fall, 400 feet. Jackson sheets.

San Antonio Creek (R); Calaveras County; rises in the northeastern part of T. 5 N., R. 15 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows southwestward 30 miles into South Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 4,100 feet; principal tributary, Indian Creek. Big Trees and Jackson sheets.

San Domingo Creek (R); Calaveras County; rises in the eastern part of T. 4 N., R. 14 E., Mount Diablo base and meridian, at altitude 3,300 feet above sea level; flows, in general, southwestward 18 miles into South Fork of Calaveras River (tributary through Calaveras River to the San Joaquin); fall, 2,300 feet; principal tributary, French Gulch Creek. Big Trees and Jackson sheets.

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San Emigdio Creek (L); Kern County; rises in the southern part of T. 9 N., R. 21 W.; flows, in general, west of north toward Buena Vista reservoir in San Joaquin Valley; intermittent. Gaging station at San Emigdio ranch house (1894–95). Mount Pinos sheet.

San Joaquin River; rises in the high Sierra southeast of the Yosemite National Park, where it is formed by the junction of Middle and South forks in the northern part of T. 6 S., R. 25 E., Mount Diablo base and meridian; flows southwestward to the trough of San Joaquin Valley, where it takes a northwesterly course to Suisun Bay, into which it discharges about 50 miles by water from San Francisco; navigable as far as Stockton, about 50 miles above its mouth; total length, approximately 350 miles—125 miles in the mountains and 225 in the valley.

The South Fork, which drains the larger area and is therefore considered the head of the main stream, rises in Martha Lake, southwest of Mount Goddard, at altitude 11,007 feet above sea level; flows northwestward about 40 miles, then turns to the west and southwest to join the main fork; total length, 44 miles; principal tributaries, Evolution, Piute, Bear, and Mono creeks. The basin is bordered on the east by the Sierra Nevada, whose crest it touches for a distance of 40 miles. Elevations range from 4,000 feet at the junction with the main fork to more than 13,000 feet at the highest summits. The tributaries drain innumerable glacial lakelets, of which Wanda, Evolution, Desolation, Italy, and Muriel lakes lie more than 11,000 feet above sea level.

The important tributaries of the San Joaquin below the junction of the South and Middle forks drain parts of the west slope of the Sierra, take a course parallel to the upper San Joaquin—that is, southwest—and enter from the east. In order from south to north these are Fresno, Chowchilla, Merced, Tuolumne, Calaveras, and Mokelumne rivers. The principal streams from the Sierra south of the upper San Joaquin are, in order from north to south, Kings, Kaweah, Tule, and Kern rivers. Kaweah, Tule, and Kern rivers are not directly tributary to the San Joaquin, for they are lost in the Tulare Lake depression, which, under normal conditions, sends no water to the San Joaquin. Kings River discharges directly into the San Joaquin.

The San Joaquin basin is the south lobe of the great central valley of California, and lies southeast of an imaginary line drawn from San Francisco Bay to Lake Tahoe. The rim of the basin is formed by the crest of the Sierra Nevada at the east, the Tehachapi Range at the south, and the Coast Range at the west. The basin is somewhat larger than the Sacramento basin, with which it merges at the north. It is about 280 miles long (northwest to southeast), about 125 miles wide, is roughly rectangular in shape, and about 32,700 square miles in area.

Topographically, the San Joaquin basin comprises three parallel strips of country exhibiting marked physical differences—(1) the eastern slope of the Coast Range, having an average width of about 15 miles and a comparatively gentle slope, incised by the action of short torrential intermittent streams; (2) the western slope of the Sierra, about 65 miles in average width, comprising a long, steep slope, deeply cut by many perennial streams; and (3) the central plain, known as the San Joaquin Valley, having an average width of nearly 45 miles and a very light slope northwestward.

The eastern slope of the Coast Range comprises an area somewhat less than 4,000 square miles in extent and ranging in elevation from a few hundred feet at the edge of the valley to a few thousand feet at the summit of the range. The rocks of this area are chiefly sandstone, shales, and conglomerates. The Sierra slope comprises an area of about 16,000 square miles, ranging in altitude from a few hundred feet in the foothills to more than 14,000 feet at the crest of the Sierra. The highest peak, Mount Whitney, near the south end of the range, rises 14,501 feet above sea level.

The central valley is about 250 miles long, 45 miles wide, and comprises an area of 11,500 square miles. It is divided into an east side and a west side plain by the axial trough or line of lowest depression, which is everywhere much nearer the western

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than the eastern foothills. The general slope of the valley is upward from north to south and from the central axis toward the hills on each side. The topography of the valley is the result of a combination of alluvial fan surfaces which have their apexes at the mouths of the canyons of the tributary streams and extend outward into the valley, coalescing laterally and terminally.

About 65 per cent of the Sierra slope is included in the national forests and parks. The foothills of the Sierra are well covered with grass, brush, and timber; above the foothill zone a heavy growth of timber extends to an altitude of about 10,000 feet, above which little timber is found. The famous California big trees (*Sequoia gigantea*) grow on the Sierra slope of this basin. The upper reaches of the Coast Range support a light growth of brush and timber, but the foothills are bare. The main valley is treeless except along water courses or in irrigated areas.

The mean annual precipitation in the San Joaquin basin varies with elevation, latitude, and longitude. The southern part of the central valley is strictly arid, the rainfall there being less than 5 inches annually; northward along the trough of the valley the rainfall gradually increases, and near the north end the average is nearly 20 inches. The west-side slope has light rainfall, which increases with elevation up to about 5,000 feet and then decreases somewhat up to the summit. The same progressive increase from south to north that exists in the valley continues along the summit. This is well shown by the total rainfall from the northern and southern Sierra, which amounts to about 11,500,000 acre-feet annually. Of this amount, about 3,000,000 acre-feet is supplied by the streams south of the upper San Joaquin from about 7,500 square miles, and 8,500,000 acre-feet from about 5,100 square miles drained by the San Joaquin and its tributaries from the more northern Sierra. The precipitation occurs during the "rainy season," which begins in the late fall and ends in early spring. Snowfall is heavy in the higher mountain region, and does not disappear until late in the summer.

Large areas in the north end of San Joaquin Valley are inundated by the spring floods unless protected by artificial levees. The greater part of the flood waters come from the Sacramento system, but the most disastrous effects result from simultaneous floods in the two systems.

The minimum flow of the streams is sufficient to generate about 600,000 horsepower without storage. This amount could be increased by storage to about 1,500,000 horsepower. The most important streams for power development are the upper San Joaquin, Kings, and Kern rivers.

Gaging stations near Friant (Pollasky), (1907–1912); Herndon (1870–1910), near Newman (1912), at Hamptonville (1878–1884), Newman (1912). For list of stations maintained in streams in San Joaquin basin to 1912, inclusive, see pages 100–102.

Surveys and data: Mount Lyell and Kaiser sheets, Water-Supply Paper, U. S. Geol. Survey, No. 271, 1911, pp. 165–168.

San Joaquin River, Middle Fork (R); rises in Thousand Island Lake, in the Sierra National Forest, in the northern part of Madera County, about 5 miles east of Mount Lyell, at altitude of 9,850 feet above sea level, flows southeastward about 6 miles, southward 8 miles, then southwest about 11 miles to its junction with the South Fork; fall in the 25 miles below Thousand Island Lake, 5,850 feet; principal tributary, North Fork of San Joaquin, which enters at Junction Butte; many small tributaries. In the upper part of the basin of the Middle Fork lakes are numerous. Mount Lyell and Kaiser sheets.

San Joaquin River, North Fork [of Middle Fork] (R); Madera County; rises in northern part of the Sierra National Forest, on the southeastern slope of Mount Lyell (altitude, 13,090 feet); flows irregularly southward 16 miles to junction with Middle Fork of San Joaquin River near Junction Butte; fall, 7,000 feet; tributaries, numerous, but only three are named on the maps—Long, Dike, and Iron creeks. The basin of the North Fork contains fewer lakes than that of the Middle Fork. Mount Lyell sheet.

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San Joaquin River, North Fork (R); Madera County; rises in the northern part of T. 5 S., R. 22 E., at altitude 8,300 feet above sea level; flows southward to its junction with San Joaquin River, in the central part of T. 9 S., R. 23 E.; length, 24 miles; principal tributaries, Willow, South Fork, and Whiskey creeks, all from the east; fall, about 7,000 feet; Kaiser and Mariposa sheets; map of the Sierra Nevada of central California, publication No. 12 of the Sierra Club, January, 1896.

San Joaquin River, North Fork, South Fork of (L); Madera County; rises in the western part of T. 7 S., R. 23 E., where it is formed by the junction of Sand and Browns creeks; flows southward 6 miles into Little North Fork of San Joaquin River, in the western part of T. 8 S., R. 23 E.; fall below junction, 1,500 feet. Kaiser sheet.

San Joaquin River, South Fork. *See* San Joaquin River.

San Luis Creek (L); Merced County; rises in the central part of T. 11 S., R. 7 E.; flows irregularly northeastward about 18 miles; enters San Joaquin Valley between Ingomar and Volta: sinks below the foothills. Land Office map of California, 1907. Fisk and Johnson map.

Sand Creek (L); Fresno and Tulare counties; rises in the southwestern part of T. 14 S., R. 26 E., Mount Diablo base and meridian; flows southwestward to San Joaquin Valley; sinks below the foothills. Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Sand Creek (R); Madera County; rises in the southern part of T. 6 S., R. 23 E., on the western slope of Chiquito Ridge, at altitude 7,500 feet above sea level; flows southwestward 7 miles to the South Fork of Little North Fork of San Joaquin River at Browns Creek; fall above junction with Browns Creek, 3,900 feet; principal tributary, West Fork; the upper course of this stream lies through a broad, open meadow. Kaiser sheet.

Sand Creek, West Fork (R); Madera County; rises in the southwestern part of T. 6 S., R. 23 E., 1½ miles south of Chilkoot Lake, at altitude 7,500 feet above sea level; flows west of south 3½ miles into Sand Creek (tributary to South Fork of Little North Fork of San Joaquin River); fall above Sand Creek, 2,300 feet. Kaiser sheet.

Sandy Creek, Big (L); Fresno County; rises in the southeastern part of T. 10 S., R. 23 E., on the southern slope of Big Sandy Bluffs, at altitude 3,000 feet above sea level; flows southwestward 1 mile, then northwestward through Big Sandy Valley to its junction with San Joaquin River, in the central part of T. 10 S., R. 22 E.; length, about 10 miles; fall, 2,700 feet, of which 1,000 feet occurs in the first half mile at head; principal tributary, Little Sandy Creek, called Bold Creek on Sierra Club's map of the Sierra Nevada of central California; intermittent. Kaiser and Mariposa sheets.

Sandy Creek, Little (R); Fresno County; rises in the extreme southwestern part of T. 9 S., R. 23 E.; on the north slope of Backbone Mountain, at altitude 2,200 feet above sea level; flows, in general, southward to its junction with Big Sandy Creek (tributary to San Joaquin River) in the western part of T. 10 S., R. 23 E.; fall, about 800 feet; intermittent. Kaiser sheet.

Santiago Creek (L); Kern County; rises in the northern part of T. 9 N., R. 22 W., at altitude 7,000 feet above sea level; flows, in general, westward 5 miles, then northward toward Buena Vista Lake Reservoir in San Joaquin Valley; intermittent. Mount Pinos sheet.

Sawmill Creek (L); Eldorado County; rises in the northwestern part of T. 9 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows southward 1 mile into French Creek (tributary through Big Canyon Creek to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 200 feet. Placerville sheet.

Saxon Gulch Creek (L); Mariposa County; Sierra National Forest; rises in the southeastern part of T. 4 S., R. 18 E., Mount Diablo base and meridian, at altitude 3,300 feet above sea level; flows northwestward 3 miles, then northward 1½ miles into Merced River (tributary to San Joaquin River); fall, 2,100 feet. Yosemite sheet.

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Scepter Creek (R); Fresno County; Sierra National Forest; rises in the southwestern part of T. 10 S., R. 29 E., Mount Diablo base and meridian, at altitude 10,000 feet above sea level; flows southeastward 7 miles into Crown Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); fall, 3,000 feet. Mount Goddard and Tehipite sheets.

Scodie Canyon Creek (L); Kern County; Sierra National Forest; rises in the southern part of T. 26 S., R. 36 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows westward 3 miles, then northwestward 6 miles; sinks before reaching South Fork of Kern River (tributary to Kern River); fall, 3,600 feet; intermittent. Kernville sheet.

Scott Creek (L); Eldorado County; rises in the western part of T. 8 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,300 feet above sea level; flows westward 2 miles into South Fork of Cosumnes River (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 1,000 feet. Pyramid Peak sheet.

Senger Creek (R); Fresno County; rises in the Sierra National Forest, on Mount Senger (altitude, 12,253 feet); flows southwestward 4 miles into South Fork of San Joaquin River (head of San Joaquin); fall, 3,800 feet. Mount Goddard sheet.

Shadow Creek (R); Madera County; flows from a small glacier on the south slope of Ritter Mountain (elevation, 13,156 feet); course, somewhat north of east to junction with Middle Fork of San Joaquin River; length, about 5 miles; fall, 3,700 feet; flows through several lakes, of which the largest and lowest is Shadow Lake; tributaries, short, unnamed streams, draining northern slope of Volcanic Ridge and the eastern slope of the Minarets. The basin of this creek contains a dozen or more small glacial lakes and several of the tributaries head in living glaciers. Mount Lyell sheet.

Shadow Lake; Madera County; northeastern part of the Sierra National Forest, 1 mile north of eastern end of Volcanic Ridge; inlet, Shadow Creek, which flows through the lake to its junction with Middle Fork of San Joaquin River; elevation, 8,750 feet; fall of Shadow Creek in the half mile between Shadow Lake and the San Joaquin, about 600 feet. Mount Lyell sheet.

Shamrock Lake; Tuolumne County; Yosemite National Park; central part of T. 2 N., R. 23 E., Mount Diablo base and meridian, three-fourths mile south of Tallulah Lake and 1 mile south of Doe Lake; no outlet mapped, but contours indicate a pass northward to a stream connecting Tallulah Lake with Piute Creek; very small. Yosemite National Park map.

Shaver Lake; Fresno County; T. 9 S., on line between Rs. 24 and 25; inlet, Stevenson Creek and several smaller streams; outlets, Stevenson Creek to San Joaquin River; elevation, 5,271 feet; just below the lake the water of Stevenson Creek is diverted to the flume of the Fresno Flume and Irrigation Co.; the lake is 1½ miles long and one-half mile in maximum width. Kaiser sheet.

Sheep Creek (L); Fresno County; Sequoia National Forest; rises in the southern part of T. 13 S., R. 30 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level; flows, in general, northeastward 4 miles into South Fork of Kings River (tributary through Kings River to the San Joaquin); near Cedar Grove Hotel; fall, 5,000 feet; many short, branching tributaries. Tehipite sheet.

Sheep Creek (R); Tulare County; Sequoia National Forest; rises in the northern part of T. 16 S., R. 28 E., Mount Diablo base and meridian, on the west slope of Sheep Ridge, at altitude 3,000 feet above sea level; flows southeastward 4 miles into North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 1,900 feet. Tehipite sheet.

Sherlock Gulch Creek (L); Mariposa County; rises in the southern part of T. 4 S., R. 18 E., Mount Diablo base and meridian, at altitude 3,250 feet above sea level; flows northwestward 6½ miles into Merced River (tributary to San Joaquin River); fall, 2,250 feet. Yosemite and Sonora sheets.

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Shingle Creek (R); Eldorado County; rises in the northeastern part of T. 9 N., R. 9 E., Mount Diablo base and meridian, south of Shingle Springs, at altitude 1,400 feet above sea level; flows southward 3 miles into French Creek (tributary through Big Canyon Creek to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 500 feet. Placerville sheet.

Shirley Creek (L); Stanislaus County; rises in the southeastern part of T. 1 N., R. 11 E., Mount Diablo base and meridian; flows north of west about 10 miles into Rock Creek (tributary through French Camp Creek to San Joaquin River); Land Office map of California, 1907.

Shotgun Creek (L); Tulare County; Sequoia National Forest; rises in the northwestern part of T. 18 S., R. 32 E., Mount Diablo base and meridian, on the western slope of the Great Western Divide, in Silver Lake, at altitude 10,500 feet above sea level; flows southward 3 miles into Little Kern River; fall, 3,000 feet. Kaweah sheet.

Silliman Creek (R); Tulare County; Sequoia National Park; rises in the northern part of T. 15 S., R. 30 E., Mount Diablo base and meridian, on Mount Silliman (altitude, 11,188 feet); flows southwestward 4 miles into Marble Fork of Kaweah River (tributary through Middle Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 3,200 feet. Tehipite sheet.

Silver Creek (L); Fresno County; rises in the Sierra National Forest in Margaret Lakes, on the west slope of Silver Peak (altitude, 11,883 feet); flows northwestward 6 miles into Fish Creek (tributary through Middle Fork of San Joaquin to South Fork of San Joaquin, head of San Joaquin River); just below Fish Valley; fall below Margaret Lakes, about 4,000 feet; this stream receives the drainage from the west slope of Shark Tooth, Silver Peaks, and the north slope of Saddle Mountain; a number of small lakes near the head of the stream. Kaiser and Mount Lyell sheets.

Silver Creek (L); Fresno County; Sierra National Forest; rises in the western part of T. 12 S., R. 30 E., Mount Diablo base and meridian, on the western slope of Mount Harrington, at altitude 8,000 feet above sea level; flows westward 1½ miles, then northwestward 1½ miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 4,200 feet. Tehipite sheet.

Silver Creek (R); San Benito and Fresno counties; rises in the eastern part of T. 16 S., R. 12 E.; flows northward to Panoche Creek; length, 6 miles; carries water only during the rainy season. Land Office map of California, 1907.

Silver Lake; Tulare County; Sequoia National Forest; northwestern part of T. 18 S., R. 32 E., Mount Diablo base and meridian, west slope of the Great Western Divide; outlet, Shotgun Creek to Little Kern River (tributary to Kern River); altitude, 10,500 feet. Kaweah sheet.

Silver Lakes; Tulare County; Sequoia National Forest; southwestern part of T. 17 S., R. 32 E., Mount Diablo base and meridian; outlet, East Fork of Kaweah River to Kaweah River (tributary to Tulare Lake basin); two small connected lakes, the lower 10,300 feet above sea level and the higher, 10,600 feet above. Kaweah sheet.

Sister Lake; Tuolumne County; Yosemite National Park; western part of T. 2 N., R. 23 E., Mount Diablo base and meridian; outlet, a stream one-half mile long flowing southwestward to Smedberg Lake (tributary to Benson Lake on Piute Creek and thus through Tuolumne River to the San Joaquin); altitude, 9,550 feet; fall of outlet, 336 feet. Yosemite National Park map.

Sixmile Creek (L); Calaveras County; rises in the central part of T. 3 N., R. 14 E., Mount Diablo base and meridian, 1 mile south of Murphy, at altitude 2,200 feet above sea level; flows southwestward 6 miles, then northwestward into Angels Creek (tributary through Stanislaus River to the San Joaquin); fall, 1,000 feet; principal tributary, Indian Creek. Big Trees and Jackson sheets.

Skeleton Creek (L); Mariposa County; Sierra National Forest; rises in the central part of T. 4 S., R. 19 E., Mount Diablo base and meridian, at altitude 4,400 feet; flows

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southeastward 2 miles, then northeastward 2 miles into Devil Gulch Creek; fall, 1,900 feet. Yosemite sheet.

Skull Creek (L); Tuolumne County; rises in the central part of T. 5 N., R. 17 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows southwestward 8 miles into Griswold Creek (tributary through North Fork of Stanislaus River to Middle Fork of Stanislaus and thus through Stanislaus River to the San Joaquin); fall, 2,200 feet; principal tributary, Fisher Creek. Big Trees sheet.

Slate Creek (L); Amador County; rises in the east central part of T. 8 N., R. 11 E., Mount Diablo base and meridian, 1 mile southwest of Bridgeport, at altitude 2,100 feet above sea level; flows northwestward 1 mile into South Fork of Cosumnes River (tributary through Middle Fork of Cosumnes River to Cosumnes River and thus through Mokelumne River to the San Joaquin); fall, 300 feet. Placerville sheet.

Slate Creek (L); Calaveras County; rises in the southwestern part of T. 3 N., R. 11 E., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows northwestward 4½ miles, then northeastward 1½ miles into Bear Creek (tributary through Calaveras River to the San Joaquin); fall, 650 feet. Jackson sheet.

Slate Creek (L); Eldorado County; rises in the northern part of T. 9 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows, in general, west of south 5 miles into Big Canyon Creek (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,000 feet; principal tributary, Fanny Creek. Placerville sheet.

Slide Creek (L); Fresno County; Sierra National Forest; rises in the east-central part of T. 12 S., R. 30 E., Mount Diablo base and meridian, on the south slope of Slide Peak, at altitude 10,300 feet above sea level; flows northward 5 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 4,600 feet, of which 2,300 feet is made in the last mile in which the creek plunges over Slide Bluffs; principal tributary Kennedy Canyon Creek. Tehipite sheet.

Sly Park Creek (R); Eldorado County; rises in the northern part of T. 10 N., R. 14 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows, in general, westward 7 miles, then southwestward 7 miles into Camp Creek (tributary through North Fork of Cosumnes River and Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,500 feet. Pyramid Peak and Placerville sheets.

Smedberg Lake; Tuolumne County; Yosemite National Park, western part of T. 2 N., R. 23 E., Mount Diablo base and meridian; inlet, stream from Sister Lake; outlet, a stream 2 miles long, flowing westward to Benson Lake, on Piute Creek (tributary through Tuolumne River to the San Joaquin); altitude, 9,214 feet; fall of outlet, 1,164 feet. Yosemite National Park map.

Smith Canyon Creek (L); Kern County; Sierra National Forest; rises in the southern part of T. 26 S., R. 36 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows northwestward 8 miles; sinks before reaching South Fork of Kern River (tributary to Kern River); fall, 3,100 feet; intermittent. Kernville sheet.

Smith Creek (R); Mariposa County; rises in the northeastern part of T. 2 S., R. 16 E., Mount Diablo base and meridian, at altitude 3,500 feet above sea level; flows southeastward 7 miles into North Fork of Merced River (tributary to San Joaquin River); fall, 1,100 feet; principal tributary, Bean Creek; upper course intermittent. Sonora sheet.

Smith Creek (R); Tulare County; Kern National Forest; rises in the southern part of T. 20 S., R. 34 E., Mount Diablo base and meridian, in Horse Meadow, at altitude 8,300 feet above sea level; flows southward 2 miles, then southwestward 3 miles into Rattlesnake Creek (tributary to Kern River); fall, 2,000 feet. Olancha sheet.

Snake Creek (R); Tulare County; Kern National Forest; rises in the western part of T. 20 S., R. 35 E., Mount Diablo base and meridian, at altitude 8,500 feet above sea

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level; flows irregularly eastward 4 miles into South Fork of Kern River (tributary to Kern River) in Back Meadows; fall, 700 feet. Olancha sheet.

Snow Creek (R); Mariposa County; Yosemite National Park, rises in May Lake in the western part of T. 1 S., R. 23 E., at altitude 9,250 feet above sea level; flows southwestward 7 miles into Tenaya Creek (tributary through Merced River to San Joaquin River) at the lower end of Tenaya Canyon, which it enters by a fall of 1,600 feet; total fall below May Lake, 4,550 feet. Yosemite National Park map.

Snyder Gulch Creek (L); Mariposa County; Sierra National Forest; rises in the central part of T. 4 S., R. 19 E., Mount Diablo base and meridian, at altitude 4,800 feet above sea level; flows northeastward 3 miles into Devil Gulch Creek (tributary through South Fork of Merced River to Merced River and thus to the San Joaquin); fall, 2,900 feet. Yosemite sheet.

Soap Creek (L); Tuolumne County; rises in the northwestern part of T. 4 N., R. 17 E., Mount Diablo base and meridian, at altitude 4,800 feet above sea level; flows westward 6 miles into Griswold Creek (tributary through North Fork of Stanislaus to Middle Fork of Stanislaus River and thus through Stanislaus River to the San Joaquin); fall, 1,200 feet. Big Trees sheet.

Soda Creek (R); Tulare County; Kern National Forest; rises in the northwestern part of T. 20 S., R. 35 E., Mount Diablo base and meridian, at altitude 9,100 feet above sea level; flows south of east 3 miles into South Fork of Kern River (tributary to Kern River) at the east base of Monache Mountain; fall, 700 feet. Olancha sheet.

Soda Creek (R); Tulare County; Sequoia National Forest; rises in the eastern part of T. 18 S., R. 31 E., Mount Diablo base and meridian, at altitude 9,000 feet above sea level; flows southeastward 8 miles into Little Kern River (tributary to Kern River); fall, 2,800 feet. Kaweah sheet.

Soda Creek (R); Tulare County; Sequoia National Forest; rises in the western part of T. 17 S., R. 32 E., Mount Diablo base and meridian, on the eastern slope of the Great Western Divide, in a small lake at altitude 10,350 feet above sea level; flows southeastward 1½ miles, then northeastward 3 miles into Big Arroyo (tributary to Kern River); fall, 2,400 feet. Kaweah and Olancha sheets.

Soldier Lake; Tuolumne County; Yosemite National Park; northern part of T. 2 N., R. 24 E., Mount Diablo base and meridian; outlet, an intermittent stream 1 mile long, flowing southeastward to Return Creek (tributary through Tuolumne River to the San Joaquin); altitude, 10,600 feet; fall of outlet, 1,500 feet. Yosemite National Park map.

Sonora Creek (L); Tuolumne County; rises 2½ miles northeast of Sonora, at altitude 2,500 feet; flows southwestward 2½ miles into Woods Creek (tributary through Tuolumne River to the San Joaquin); fall, 700 feet; passes through the town of Sonora. Sonora sheet.

Sopiago Creek (L); Eldorado County; rises in the eastern part of T. 8 N., R. 14 E., Mount Diablo base and meridian, at altitude 5,300 feet above sea level; flows northwestward 10 miles into Middle Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 2,600 feet. Pyramid Peak and Placerville sheets.

Sotcher Lake; Madera County; eastern part of the Sierra National Forest; outlet, Reds Creek, which flows through the lake to its junction with Middle Fork of San Joaquin River; elevation, 8,650 feet; fall of Reds Creek below the lake, about 150 feet in three-fourths mile. Mount Lyell sheet.

South American Lake; Tulare County; Sequoia National Forest; 1½ miles southeast of Mount Ericson and 1½ miles west of Diamond Mesa; outlet, a stream 1 mile long, flowing westward to a small lake near the head of Kern River; altitude 12,000 feet above sea level; fall of outlet, 700 feet. Mount Whitney sheet.

Spanish Creek (L); Eldorado County; rises in the southern part of T. 9 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,500 feet above sea level; flows northwestward 3 miles, then southeastward 3 miles into Middle Fork of Cosumnes River

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(tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin). Placerville sheet.

Spanish Lake; Fresno County; Sierra National Forest; southern part of T. 11 S., R. 28 E., Mount Diablo base and meridian; outlet, Statum Creek to Rancheria Creek (tributary through North Fork of Kings River to Kings River and thus to the San Joaquin); altitude, 8,600 feet; fall of outlet above Rancheria Creek, 1,100 feet. Tehipite sheet.

Sphinx Creek (L); Tulare County; rises in the northwestern part of T. 14 S., R. 32 E., on the north slope of Sphinx Crest at altitude 10,500 feet above sea level; flows west of north about 4 miles into Bubbs Creek (tributary to South Fork of Kings River); fall, 4,000 feet. Tehipite sheet.

Sphinx Lakes; Tulare County; northwestern part of T. 14 S., R. 32 E., Mount Diablo base and meridian, north slope of Sphinx Crest; outlet, Sphinx Creek to Bubbs Creek (tributary to South Fork of Kings River and thus through Kings River to the San Joaquin); five connected lakes, all small. Tehipite sheet.

Spiller Creek (R); Tuolumne County; Yosemite National Park; rises in the southwestern part of T. 3 N., R. 24 E., Mount Diablo base and meridian, between Twin Peaks and Whorl Mountain, at altitude 10,100 feet; flows west of south 6½ miles into Return Creek; fall, 1,700 feet; principal tributary, stream from Spiller Lake. Yosemite National Park map.

Spiller Lake; Tuolumne County; Yosemite National Park; northwestern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, 1 mile west of Soldier Lake; outlet, a stream 1 mile long, flowing southwestward to Spiller Creek (tributary through Return Creek to Tuolumne River and thus to San Joaquin River); altitude, 10,650 feet; fall of outlet, 1,400 feet; about one-eighth mile long and wide. Yosemite National Park map.

Split Rock Creek (R); Mariposa County; rises in the northwestern part of T. 7 S., R. 19 E., on Split Rock, at altitude 1,500 feet above sea level; flows southward 4 miles into Chowchilla River (tributary to San Joaquin River); fall, 800 feet. Mariposa sheet.

Spring Creek (R); Fresno County; Sierra National Forest; rises in the northeastern part of T. 12 S., R. 27 E., Mount Diablo base and meridian, on the south slope of Rodgers Ridge, at altitude 6,800 feet above sea level; flows southward 3½ miles into Kings River (tributary to San Joaquin River); fall, 5,300 feet. Tehipite sheet.

Spring Gulch Creek (L); rises in the southern part of T. 5 S., R. 19 E.; flows westward 2 miles into Mariposa Creek; tributary to San Joaquin River. Mariposa sheet.

Squaw Hollow Creek (L); Eldorado County; rises in the southeastern part of T. 10 N., R. 11 E., Mount Diablo base and meridian, at altitude 2,900 feet above sea level; flows, in general, southwestward 8 miles into Martinez Creek, through which it is tributary through the North Fork of Cosumnes River (tributary through Cosumnes River to the Mokelumne River and thus to the San Joaquin); fall, 1,700 feet. Placerville sheet.

Squirrel Creek (R); Tulare County; Sequoia National Park; rises in the northwestern part of T. 17 S., R. 30 E., Mount Diablo base and meridian, at altitude 4,500 feet above sea level; flows southwestward 1½ miles into East Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 1,500 feet; intermittent. Kaweah sheet.

Staff Creek (L); Kern County; Sierra National Forest; rises in the northern part of T. 28 S., R. 34 E., Mount Diablo base and meridian, at altitude 6,800 feet above sea level; flows northeastward 6 miles into Kelso Creek (tributary to South Fork of Kern River); fall, 3,700 feet; intermittent. Kernville sheet.

Stafford Creek (R); Eldorado County; rises in T. 9 N., R. 10 E., Mount Diablo base and meridian, 1 mile east of Frenchtown, at altitude 1,500 feet above sea level;

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flows east of south 1½ miles into Big Canyon Creek (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 500 feet. Placerville sheet.

Stairway Creek (R); Madera County; rises in the Sierra National Forest, on the southeast slope of Iron Mountain, at altitude 10,000 feet above sea level; flows southward about 4 miles and unites with Middle Fork of San Joaquin River 2 miles above the junction of the North Fork; fall, about 4,800 feet. Mount Lyell sheet.

Stanislaus River (R); formed in the southwestern part of T. 4 N., R. 15 E., by the confluence of its North and Middle forks. The Middle Fork, which drains the larger area and is, therefore, considered the continuation of the main stream, is formed in the northeastern part of T. 5 N., R. 20 E., by the confluence of Relief and Dead Man creeks, Relief being the larger and more important and, therefore, forming the actual head of the Stanislaus. Relief Creek rises in the northern part of T. 4 N., R. 21 E., 2 miles southeast of Relief Peak, and takes a general northwesterly course for 10 miles to its junction with Dead Man Creek, below which the stream takes the name Middle Fork of Stanislaus and continues to flow northwesterly 9 miles to the center of T. 6 N., R. 19 E., where it receives Clark Fork; below the mouth of Clark Fork, the general course of the stream is southwestward to its junction with the San Joaquin, about 15 miles west of Modesto; the Middle Fork receives the North Fork about 20 miles north of Sonora and 30 to 35 miles above the rim of San Joaquin Valley. About 8 miles below the junction of North and Middle forks, the main stream is joined by the South Fork. Total length of the river from the head of the Middle Fork to the San Joaquin, about 120 miles, 80 miles of the course lying in the mountains, and 40 in the valley; the total drainage area above the valley comprises about 950 square miles. North Fork above and the main stream below form a boundary between Calaveras and Tuolumne counties.

The basin lies on the western slope of the Sierra, north of the Tuolumne basin, south of the Calaveras and Mokelumne basins, and west of Walker River basin, from which it is separated for a distance of about 25 miles by the Sierra divide; the length of the basin from the valley rim to the crest of the divide is about 75 miles; its width averages about 12 miles in the foothills and less than 25 miles near the eastern border.

Altitudes within the basin range from a few hundred feet in the foothills to more than 11,000 feet at the crest of the divide. Middle Fork flows through a well-developed canyon 30 or 40 miles long and 1,500 to 2,000 feet deep.

Except near glacial lakelets and on moraines, little timber is found above the 8,000-foot level; middle reaches, however, support a heavy growth of timber. North Fork basin contains a part of the Calaveras grove of big trees (*Sequoia gigantea*), for which the Sierra is famous. The vegetation of the foothill region consists of grass, brush, and scrubby timber. All the upper part of the basin, comprising about 800 square miles, is included in national forests.

The mean annual precipitation ranges from about 15 inches near the border of the valley to 50 or 60 inches at the higher elevations, where it occurs chiefly as snow, which lasts well into the summer. The worst floods in this basin occur in the winter, when prolonged storms are accompanied by comparatively high temperatures.

Water is diverted above Knights Ferry and used for irrigation chiefly in the vicinity of Oakdale.

The Middle and North forks and the main stream below the junction afford excellent opportunities for power development. The minimum flow is sufficient to yield about 80,000 horsepower, and this amount could be increased by storage.

Gaging stations at Oakdale (1895–1900), at Knights Ferry (1904–1912).

Surveys and data: Dardanelles, Big Trees, and Jackson sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 204–205.

Stanislaus River, Clark Fork (R); Alpine County; Stanislaus National Forest; rises on the west slope of Sonora Peak (altitude, 11,429 feet); flows west of north 6

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miles, westward 3 miles, then southwestward 8 miles into Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin) just west of the Alpine-Tuolumne County boundary line in T. 6 N., R. 19 E.; fall, 4,700 feet; the canyon is deep and the basin includes a number of peaks more than 9,000 feet high, and two, Sonora and Stanislaus peaks, more than 11,000 feet above sea level; principal tributaries, Boulder, Disaster, and Arnot creeks. Dardanelles sheet.

Stanislaus River, Middle Fork. See *Stanislaus River.*

Stanislaus River, North Fork (R); Alpine, Tuolumne and Calaveras counties; rises in Alpine County, 3 miles northwest of Bull Run Peak, 1 mile west of Pacific Valley, at altitude 8,000 feet above sea level; takes a general southwesterly course to its junction with Middle Fork of Stanislaus River (tributary through Stanislaus River to the San Joaquin); length, 35 miles; fall, 6,600 feet; principal tributaries, Highland and Griswold creeks, both from the east; altitudes range from 1,400 feet at the mouth of the river to 9,750 feet at Iceberg Peak on the divide between Highland and Arnot peaks. Dardanelles and Big Trees sheets.

Stanislaus River, South Fork (L); Tuolumne County; Stanislaus National Forest; rises in the southwestern part of T. 5 N., R. 20 E., Mount Diablo base and meridian; at altitude 9,200 feet above sea level; flows southwestward to its junction with Stanislaus River (tributary to the San Joaquin); length, 40 miles; fall, 8,200 feet; drainage basin long and very narrow; tributaries unimportant with the exception of Herring Creek. Gaging station near Columbia (1910–1912); at Confidence (1911–1912). Dardanelles and Big Trees sheets.

State Lakes; Fresno County; Sierra National Forest, just west of Dougherty and State peaks; four small lakes fed by the snow banks of Cirque Crest; outlet, a stream 1 mile long, flowing westward through East Fork of Dougherty Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); the highest of the lakes is 11,000 feet above sea level; the lowest and largest is 10,300 feet above. Tehipite sheet.

Statum Creek (L); Fresno County; Sierra National Forest; rises in the southern part of T. 11 S., R. 28 E., Mount Diablo base and meridian, in Spanish Lake, at altitude 8,600 feet above sea level; flows northwestward 3 miles into Rancheria Creek (tributary through North Fork of Kings River to Kings River and thus to the San Joaquin); fall, 1,100 feet. Tehipite sheet.

Steeley Fork (L); Eldorado County; rises in the central part of T. 9 N., R. 14 E., Mount Diablo base and meridian, at altitude 5,700 feet above sea level; flows irregularly westward into North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); length, 13 miles; fall, 3,200 feet; principal tributaries, Grizzly and Clear creeks. Pyramid Peak and Placerville sheets.

Stevenson Creek (R); Fresno County; rises in the eastern part of T. 9 S., R. 25 E., at altitude 7,900 feet above sea level; flows, in general, south of west about 3 miles, then northwestward about 8 miles, passing through Shaver Lake to its junction with the San Joaquin; fall between head of stream and San Joaquin River, 4,700 feet, of which 1,700 feet occurs in the last three-fourths mile; fall above Shaver Lake, 2,100 feet; one-half mile west of Shaver the water of this creek is diverted to the flume of the Fresno Flume & Irrigation Co. Kaiser sheet.

Stevenson Creek, North Fork (R); Fresno County; rises in the northeastern part of T. 9 S., R. 25 E., at altitude 6,900 feet above sea level; flows southwestward 5 miles to its junction with Stevenson Creek (tributary to San Joaquin River) one-half mile above Shaver Lake; fall, 2,000 feet. Kaiser sheet.

Stonebreaker Creek (R); Eldorado County; rises in the western part of T. 10 N., R. 14 E., Mount Diablo base and meridian, at altitude 4,900 feet above sea level; flows northwestward about 4 miles, then southwestward 3 miles into Camp Creek (tributary through North Fork of Cosumnes River and Cosumnes River to the Mokel-

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umne and thus to the San Joaquin); fall, 1,400 feet; called Strawberry Creek on Punnett's map of Eldorado County. Pyramid Peak sheet.

Stony Creek (R); Tulare County; Sequoia National Forest; rises in the central part of T. 14 S., R. 29 E., Mount Diablo base and meridian, at altitude 7,980 feet above sea level; flows southwestward 4½ miles to the northwestern part of T. 15 S., R. 29 E., where it unites with Dorst Creek to form the North Fork of Kaweah River (tributary through Kaweah River to Tulare Lake basin); fall, 3,300 feet; principal tributary, Beartrap Creek. Tehipite sheet.

Strawberry Creek, Eldorado County. See *Stone Breaker Creek*.

String Canyon Creek (L); Eldorado County; rises in the northern part of T. 9 N., R. 13 E., Mount Diablo base and meridian, 1 mile north of Grizzly Flat, at altitude 4,100 feet above sea level; flows southwestward 3 miles to Cedar Canyon, to which it is tributary through Steeley Fork of North Fork of Cosumnes River (tributary through Cosumnes River to Mokelumne River and thus to the San Joaquin); fall, 1,200 feet. Placerville sheet.

Striped Rock Creek (R); Mariposa and Madera counties; rises in the western part of T. 6 S., R. 19 E., on Lookout Mountain, at altitude 2,000 feet above sea level; flows, in general, southeastward to its junction with Chowchilla River (tributary to San Joaquin River); principal tributary, Horse Creek; fall, 1,200 feet; length, 9 miles. Mariposa sheets.

Stubblefield Canyon Creek (R); Tuolumne County; Yosemite National Park; rises in the northern part of T. 3 N., R. 22 E., Mount Diablo base and meridian, west of Ehrnbeck Peak, at altitude 10,050 feet above sea level; flows westward 1 mile, then southwestward 9½ miles into Rancheria Creek (tributary through Tuolumne River to San Joaquin River); fall, 2,350 feet; principal tributary, Thompson Canyon Creek. Yosemite National Park map.

Sugarloaf Creek (R); Tulare County; rises in the southern part of T. 14 S., R. 30 E., on the northeast slope of Kettle Peak (altitude 10,038 feet); flows northeastward 8 miles into Roaring River (tributary to South Fork of Kings River); fall, 4,250 feet; principal tributaries, South and East forks and Bog Creek. Tehipite sheet.

Sugarloaf Creek, East Fork (R); Tulare County; rises in the extreme northeastern part of T. 15 S., R. 30 E., at altitude 9,700 feet above sea level; flows somewhat west of north 5½ miles into Sugar Loaf Creek (tributary through Roaring River to South Fork of Kings River); just above Sugar Loaf Meadow; fall, 3,000 feet. Tehipite sheet.

Sugarloaf Creek, South Fork (R); Tulare County; rises in the northeastern part of T. 15 S., R. 30 E., on the north slope of Silliman Crest, southeast of Mount Silliman (altitude 10,000 feet above sea level); flows northward 5 miles into Sugar Loaf Creek (tributary through Roaring River to South Fork of Kings River); fall, 2,300 feet. Tehipite sheet.

Sugarpine Creek (R); Tuolumne County; rises in the northern part of T. 3 N., R. 17 E., Mount Diablo base and meridian, at altitude 5,300 feet above sea level; flows southwestward 5 miles, then southeastward one-half mile into North Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 1,700 feet. Big Trees sheet.

Sullivan Creek (L); Tuolumne County; rises in the northern part of T. 2 N., R. 16 E., Mount Diablo base and meridian, at altitude 4,000 feet above sea level; flows southwestward 17 miles into Woods Creek (tributary through Tuolumne River to the San Joaquin); fall, 3,000 feet; passes through Phoenix reservoir; principal tributary, Curtis Creek. Sonora sheet.

Summit Creek (R); Alpine County; Stanislaus National Forest; rises on the western slope of the Sierra, 1 mile northwest of Blue Lake, at altitude 8,700 feet above sea level; flows southwestward 4 miles, then southward 4½ miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 3,100 feet; flows

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throughout in a deep canyon; tributaries few and unimportant. Markleeville and Pyramid Peak sheets.

Sunrise Creek (R); Mariposa County; Yosemite National Park; rises on the south slope of Sunrise Mountain, at altitude 9,000 feet above sea level; flows southwestward 4 miles; sinks at the edge of Little Yosemite Valley before reaching Merced River (tributary to San Joaquin River). Yosemite National Park map.

Surprise Lake; Tuolumne County; Yosemite National Park; western part of T. 2 N., R. 23 E., Mount Diablo base and meridian; one inlet; outlet, an intermittent stream flowing northwestward toward Piute Creek (tributary through Tuolumne River to the San Joaquin); the outlet stream sinks before reaching the creek; altitude, 9,350 feet. Yosemite National Park map.

Sutter Creek (L); Amador County; rises in the southern part of T. 8 N., R. 13 E., Mount Diablo base and meridian, at altitude 3,700 feet above sea level; flows southwestward 27 miles into Dry Creek (tributary through Mokelumne River to the San Joaquin); fall, 3,400 feet; principal tributaries, Golden Gate, Ashland, Pioneer, and Mule creeks. Jackson sheet.

Suwanee River (R); Tulare County; Sequoia National Park; rises in the northeastern part of T. 15 S., R. 29 E., Mount Diablo base and meridian, at altitude 7,600 feet above sea level; flows southward 3½ miles into Marble Fork of Kaweah River (tributary to Middle Fork of Kaweah River and thus through Kaweah River to Tulare Lake basin); fall, 2,200 feet. Tehipite sheet.

Swamp Creek (L); Fresno County; Sierra National Forest; rises in the western part of T. 9 S., R. 27 E., Mount Diablo base and meridian, on the southwestern slope of Three Sisters Mountain, at altitude 9,700 feet above sea level; flows southwestward 2 miles into Dinkey Creek (tributary to North Fork of Kings River and thus through Kings River to the San Joaquin); fall, 2,000 feet. Kaiser sheet.

Swamp Lake; Madera County; Yosemite National Park; southern part of T. 4 S., R. 23 E.; outlet, a channel one-eighth mile long, discharging eastward to South Fork of Merced River (tributary through Merced River to San Joaquin River); very small; altitude, 7,450 feet. Yosemite National Park map.

Swamp Lake; Tuolumne County; Yosemite National Park; eastern part of T. 1 N., R. 19 E., Mount Diablo base and meridian; outlet, a stream 3 miles long flowing, in general, southwestward into McGill Creek (tributary through Cherry Creek to Tuolumne River and thus to the San Joaquin); altitude, 5,150 feet; fall of outlet, 750 feet. Yosemite National Park map.

Swamp Lakes; Fresno County; Sierra National Forest; north of Monarch Divide; outlet, northward through Lost Canyon to Middle Fork of Kings River (tributary through Kings River to the San Joaquin); altitude about 9,500 feet above sea level. Tehipite sheet.

Sweetwater Creek (L); Mariposa County; rises in the central part of T. 4 S., R. 19 E., Mount Diablo base and meridian, at altitude 4,300 feet above sea level; flows northwestward 6 miles into Merced River (tributary to San Joaquin River) in the southwestern part of T. 3 S., R. 19 E.; fall, 2,900 feet. Yosemite sheet.

Sycamore Creek (R); rises in the northern part of T. 32 S., R. 31 E., Mount Diablo base and meridian, in Bear Valley; flows northwestward 6 miles toward Buena Vista Lake Reservoir; sinks on leaving the foothills. Manuscript map of San Joaquin Valley (compiled by A. J. Fisk, jr., and H. R. Johnson).

Sycamore Creek (R); Fresno County; rises in the central part of T. 10 S., R. 24 E., at altitude 4,000 feet above sea level; flows, in general, southeastward 12 miles into Kings River (tributary to San Joaquin River); principal tributaries, North Fork and Watts Creek. Kaiser sheet; Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Sycamore Creek (L); Tulare County; Sequoia National Forest; rises in the southwestern part of T. 19 S., R. 30 E., Mount Diablo base and meridian, at altitude 3,000

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feet above sea level; flows southwestward 4 miles into North Fork of Tule River (tributary through Tule River to Tulare Lake basin); fall, 1,500 feet; intermittent. Kaweah sheet.

Sycamore Creek, North Fork (L); Fresno County; rises in the eastern part of T. 10 S., R. 24 E., Mount Diablo base and meridian, at altitude 4,200 feet above sea level; flows southwestward 2½ miles into Sycamore Creek (tributary through Kings River to the San Joaquin); fall, 2,300 feet. Kaiser sheet.

Table Creek; rises in Tulare County, in the southern part of T. 14 S., R. 32 E., on the northwestern slope of Table Mountain (altitude, 13,646 feet); flows southwestward 3½ miles into Deadman Canyon[1] on Roaring River (tributary to South Fork Kings River); fall, 3,500 feet. Mount Whitney and Tehipite sheets.

Table Lake; Tuolumne County; Yosemite National Park; southern part of T. 2 N., R. 22 E., Mount Diablo base and meridian; two inlets; outlet, a stream three-fourths mile long, flowing southwestward to Piute Creek (tributary through Tuolumne River to the San Joaquin); altitude, 7,050 feet; fall of outlet, 650 feet. Yosemite National Park map.

Tallulah Lake; Tuolumne County; Yosemite National Park; central part of T. 2 N., R. 23 E., Mount Diablo base and meridian; outlet, an intermittent stream about 1 mile long, flowing westward to Doe Lake (tributary through Piute Creek to Tuolumne River and thus to the San Joaquin); altitude, 9,900 feet; very small. Yosemite National Park map.

Tamarack Creek (R); Fresno County; rises in the southern part of T. 8 S., R. 26 E., on the south slope of Red Mountain, in Red Lake, at altitude 8,900 feet above sea level; flows southward 1 mile, then north of west nearly 6 miles to its junction with the South Fork to form Pitman Creek (tributary through Big Creek to San Joaquin River); fall below Red Lake, 1,700 feet. Kaiser sheet.

Tamarack Creek (R); Mariposa County; Yosemite National Park; rises in the northeastern part of T. 2 S., R. 20 E., at altitude 7,700 feet above sea level; flows southward 3 miles, then southeastward 2 miles into Cascade Creek (tributary through Merced River to San Joaquin River); fall, 2,800 feet, of which 1,100 feet occurs in one-half mile just above the junction with Cascade Creek. Yosemite National Park map.

Tamarack Creek, South Fork (R); Fresno County; rises near the center of T. 9 S., R. 26 E., on the north slope of Foster Ridge, at altitude 8,400 feet above sea level; flows westward 2 miles into Tamarack Meadows, then northwestward 3 miles to its junction with Tamarack Creek to form Pitman Creek (tributary through Big Creek to San Joaquin River); fall, about 1,300 feet. Kaiser sheet.

Taylor Creek (R); Fresno County; rises in the eastern part of T. 10 S., R. 24 E., Mount Diablo base and meridian, 1 mile southwest of Peteras Mill, at altitude 5,500 feet above sea level; flows south three-fourths mile and east 1 mile into Rush Creek (tributary through Big Creek to Kings River and thus to the San Joaquin); fall, 900 feet. Kaiser sheet.

Taylor Creek (R); Tulare County; Sierra National Forest; rises in the north central part of T. 24 S., R. 34 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows southeastward 3½ miles, then north of east 3 miles into South Fork of Kern River (tributary to Kern River); fall, 3,100 feet. Kernville sheet.

Tecuya Creek (L); Kern County; rises in the east central part of T. 9 N., R. 20 W., on the north slope of Tecuya Mountain, at altitude 7,000 feet above sea level; flows northward 10 miles toward Buena Vista Lake Reservoir; intermittent. Tejon sheet.

Tehachapi Creek (L); Kern County; rises in the southeastern part of T. 31 S., R. 32 E.; flows northwestward to its junction with Caliente Creek at the town of

[1] The eastern branch of this canyon is said to be incorrectly named on the Tehipite sheet. The name "Deadman Canyon" is properly applied, as on Le Conte's map, to the western branch; the eastern branch is Copper Canyon. Sierra Club Bulletin, vol. 6, No. 3, June, 1907, p. 158.

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Caliente. The mountains at the head of this creek are detached hills rather than continuous ranges; the rocks are granitic, but disintegrate and form sandy soil, which absorbs much of the run-off; the canyons are narrow, but the slopes are not steep; the hills are covered with a scant growth of oak and some brush. Manuscript map of San Joaquin Valley (compiled by A. J. Fisk, jr., and H. R. Johnson); Bull. U. S. Geol. Survey No. 140, 1896, pp. 264–266.

Tejon Creek (R); Kern County; rises in the southern part of T. 11 N., R. 15 W., San Bernardino base and meridian; flows north of west toward Buena Vista Lake Reservoir. The stream flows from steep, rocky mountains; fully 85 per cent of the run-off of this drainage basin passes during the nonirrigating and nongrowing season; during the period when the water is needed for plant life the creeks discharge only about 15 per cent of the average for the year. Gaging station at Tejon ranch house (1895–96). Land Office map of California, 1907; manuscript map of the San Joaquin Valley, compiled by Fisk and Johnson.

Temperance Creek (L); Mariposa County; rises in the southwestern part of T. 3 S., R. 16 E., Mount Diablo base and meridian, at altitude 1,800 feet above sea level; flows southwestward 3 miles into Merced River (tributary to San Joaquin River); fall, 1,200 feet; intermittent. Sonora sheet.

Ten Lakes; Tuolumne County, Yosemite National Park, southeastern part of T. 1 N., R. 22 E., Mount Diablo base and meridian; four of these lakes are connected and have outlet by northward-flowing stream 2½ miles long, which discharges into Tuolumne River (tributary to the San Joaquin) just above Muir Gorge; one of the lakes discharges to this same stream by a channel one-half mile long; two of the lakes are connected by a channel one-half mile long and discharge by a stream a mile long flowing northeastward to Cathedral Creek (tributary through Tuolumne River to the San Joaquin); the lowest of these lakes is 9,000 feet above sea level, the highest is nearly 9,500 feet; the stream connecting the four lakes with the Tuolumne falls 4,000 feet. The lakes are all small. Yosemite National Park map.

Tenaya Creek (R); Mariposa County; Yosemite National Park; rises in Cathedral Lake, 1 mile west of Cathedral Peak (altitude, 10,933 feet); flows southwestward, passing through Tenaya Lake, Tenaya Canyon, and Mirror Lake to its junction with Merced River (tributary to San Joaquin River) in Yosemite Valley; length, about 12 miles; fall, 5,250 feet; Tenaya Canyon is 2,000 feet deep; fed by many small lakes. Gaging station at Yosemite (1904–1910). Yosemite National Park map.

Tenaya Lake; Mariposa County; Yosemite National Park; central part of T. 1 S., R. 23 E., Mount Diablo base and meridian; inlets, Murphy Creek and Tenaya Creek, which flows from Cathedral Lake through Tenaya Lake to its junction with Merced River (tributary to the San Joaquin); altitude, 8,141 feet; length, 1 mile; maximum width, nearly one-half mile. Yosemite National Park map.

Tenmile Creek (L); Tulare and Fresno counties; Sequoia National Forest; rises in the northeastern part of T. 14 S., R. 28 E., Mount Diablo base and meridian, on the northeastern slope of Buena Vista Peak, at altitude 7,000 feet above sea level; flows very irregularly northward 10 miles into Kings River (tributary to San Joaquin River); fall, 4,700 feet, of which 1,000 feet occurs in the last mile; principal tributaries, Tornado and Indian creeks. Tehipite sheet.

Thompson Canyon Creek (L); Tuolumne County; Yosemite National Park; rises in the northwestern part of T. 3 N., R. 23 E., Mount Diablo base and meridian, at altitude 10,100 feet above sea level; flows southwestward 8 miles into Stubblefield Canyon Creek (tributary through Rancheria Creek to Tuolumne River and thus to the San Joaquin); fall, 1,900 feet. Yosemite National Park map.

Thousand Island Lake; Madera County; northern part of the Sierra National Forest; about 5 miles east of Mount Lyell; inlets, two small streams from the eastern slope of Davis Mountain and one from Island Pass; outlet, Middle Fork San Joaquin

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River to San Joaquin River; elevation, 9,850 feet; length, 1½ miles; width, one-half mile. Mount Lyell sheet.

Tiger Creek (R); Amador County; rises in the eastern part of T. 8 N., R. 14 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows southwestward 8 miles into North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); fall, 2,500 feet. Pyramid Peak and Big Trees sheets.

Tilden Canyon Creek (R); Tuolumne County; Yosemite National Park; rises in a small lake just south of Tilden Lake at altitude 8,950 feet above sea level; flows southwestward 5 miles, then southeastward 1 mile into Rancheria Creek (tributary through Tuolumne River to the San Joaquin); fall, 1,450 feet. Yosemite National Park map.

Tilden Lake; Tuolumne County; Yosemite National Park; just east of Chittenden Peak and west of Macomb Ridge; inlet, from Mary Lake; outlet, a stream one-half mile long flowing from the south end westward to Falls Creek (tributary through Tuolumne River to San Joaquin River); altitude, 9,350 feet; fall of outlet, 750 feet; length, 2½ miles; maximum width, about one-third mile. Yosemite National Park map.

Tiltill Creek (R); Tuolumne County; Yosemite National Park; rises in the west-central part of T. 2 N., R. 21 E., Mount Diablo base and meridian, at altitude 7,450 feet above sea level; flows, in general, southwesterly about 6½ miles into Rancheria Creek (tributary through Tuolumne River to the San Joaquin) at the upper end of Hetch Hetchy Valley; fall, 3,700 feet. Yosemite National Park map.

Timber Creek (L); Madera County; rises in the Sierra National Forest, on the north slope of Timber Knob (altitude, 9,963 feet); flows southward 2 miles into West Fork of Granite Creek (tributary through Granite Creek to Middle Fork of San Joaquin River); fall, 1,700 feet. Mount Lyell sheet.

Tobias Creek (R); Tulare County; Sierra National Forest; rises in the northern part of T. 24 S., R. 32 E., Mount Diablo base and meridian; flows northeastward 4 miles into Kern River. Land Office map of California, 1907.

Tombstone Creek (R); Fresno County; Sierra National Forest; rises in the northeastern part of T. 12 S., R. 28 E., Mount Diablo base and meridian, at altitude 9,000 feet above sea level; flows southeastward 4 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 6,100 feet, of which 2,100 feet is made in the last mile. Tehipite sheet.

Toomey Creek (L); San Benito and Fresno counties; rises in the northeastern part of T. 17 S., R. 13 W.; flows east of north to San Joaquin Valley; no water except during the rainy season. Land Office map of California, 1907.

Tornado Creek (R); Fresno County; Sequoia National Forest; rises in the western part of T. 13 S., R. 29 E., Mount Diablo base and meridian, in Tornado Meadows, at altitude 7,500 feet above sea level; flows northwestward 3½ miles into Tenmile Creek (tributary to Kings River and thus to the San Joaquin); fall, 2,500 feet. Tehipite sheet.

Tracy Lake; Sacramento County; 3 miles southwest of Galt, a sloughlike expansion of Mokelumne River, fed by flood waters from Dry Creek or by overflow from Mokelumne River. Lodi sheet.

Tragedy Creek (R); Amador County; Stanislaus National Forest; rises in the eastern part of T. 9 N., R. 16 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows, in general, southwestward into Bear River (tributary through North Fork of Mokelumne River to Mokelumne River and thus to the San Joaquin); length, 5 miles; fall, 2,100 feet. Pyramid Peak sheet.

Triple Peak Fork, Merced River (R); Madera County; rises on the north slope of Triple Divide Peak, at altitude 11,000 feet above sea level; flows northward 4 miles and northwestward 1 mile into Merced Peak Fork (tributary through Merced

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River to the San Joaquin); fall, 3,100 feet; principal tributary, Foerster Creek. Mount Lyell sheet.

Trout Creek (R); Tulare County; Sierra National Forest; rises in the northeastern part of T. 22 S., R. 33 E., Mount Diablo base and meridian, at altitude 8,700 feet above sea level; flows, in general, southeastward 13 miles, to its junction with South Fork of Kern River (tributary to Kern River); fall, 3,000 feet; principal tributary, Little Trout Creek. Olancha and Kernville sheets.

Trout Creek (R); Tuolumne County; Stanislaus National Forest; rises just north of the north line of T. 3 N., R. 18 E., at altitude 6,450 feet above sea level; flows southwestward 6 miles into Clavey River (tributary through Tuolumne River to the San Joaquin) 1 mile below the mouth of Lily Creek; fall, 1,250 feet. Dardanelles and Big Trees sheets.

Trout Creek, Little (R); Tulare County; Sierra National Forest; rises in the central part of T. 23 S., R. 34 E., Mount Diablo base and meridian, on the east slope of Sirretta Peak, at altitude 8,700 feet above sea level; flows northeastward 4 miles into Trout Creek (tributary through South Fork of Kern River to Kern River); fall, 2,000 feet. Kernville sheet.

Tulainyo Lake; Tulare County; Sequoia National Forest; on the west side of the main Sierra divide, 1 mile east of north of Mount Whitney; the lake lies in a depression without outlet; altitude, 12,865 feet. Mount Whitney sheet.

Tulare Lake; Kings County, about 30 miles directly south of Fresno and 40 miles northwest of Bakersfield; a shallow body of water occupying the lowest depression in the Tulare basin; the lake is roughly rectangular in shape, and its greatest length is from northwest to southeast. In November, 1907, when its margin was carefully determined, the lake had an area of about 274 square miles, a maximum depth of 12.4 feet, an average length of 20 miles, and a width of 13.5 miles; the water's edge was 3 miles from the town of Corcoran and the water surface about 12 feet below; the lake surface reached its greatest height in the summer of 1907, when the lake had a maximum depth of nearly 14 feet.

The lake receives practically all its water from Kings, Kaweah, and Tule rivers, Kings River furnishing the largest quantity; under normal conditions all of the water of Tule River and nearly all that of Kaweah River is diverted for irrigation and only a small quantity of water from these streams reaches the lake.

For 25 years preceding 1898 the lake level was steadily lowered, in part as the result of the development of irrigation in the Tulare basin, but chiefly because of the light precipitation in the drainage basins; during this entire period the precipitation was generally below the normal, and particularly during the several years immediately preceding 1898; in that year the lake bed became practically dry and, after partly refilling in 1901, it became completely dry in 1905; as the water receded, a constantly increasing area of exceedingly fertile land was uncovered; from time to time this land was leveed on the lake side and cultivated, and in the early spring of 1906 the entire lake bed was under cultivation.

On March 15, 1906, the first water reached the lake bed at the mouth of Kings River and began to spread out over a large area of bottom land, on which stood a crop of wheat almost matured; a few days later water from Kaweah and Tule rivers entered the lake bed, rapidly submerging an increasingly large area of wheat fields; on June 1 the water was 7 feet deep and covered about 200 square miles; on June 23 overflow water from Kern River basin cut through the sand ridge to the south and flowed into the lake, which for a few days afterward rose at the rate of 0.2 foot a day; on August 4 the water reached its greatest height for the year 1906 and the lake had an area of about 300 square miles and a maximum depth of 12.7 feet; the total rise of the lake in 1906 was 10.8 feet; on this date the lake level slowly subsided until December 9, after which a rise began which continued until July, 1907, when the lake attained a maximum depth of 14 feet; since this date it has been gradually subsiding.

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The lake bed resembles a large flat saucer; the flat, level area in the bottom is approximately 180 feet above mean sea level and covers about 55 square miles; the lowest point of the crest of Kings River delta ridge at the north is about 27 feet higher than the bottom of the lake; the lake basin will not overflow naturally until the lake has a maximum depth of nearly 30 feet and an area of nearly 1,000 square miles; though classed as a tributary of the San Joaquin, the lake has sent no water to that stream since about 1868.

Gage near Corcoran, Cal. (1906–1912).

Surveys and data: Water-Supply Paper U. S. Geol. Survey Nos. 222, p. 37; 271, pp. 171–174.

Tule River (R); Tulare County; formed by the union of North and Middle forks; Middle Fork, which drains the larger area and is therefore considered the continuation of the main stream, is itself formed by the junction of its North and South forks of which the North Fork may be considered the continuation. North Fork of the Middle Fork rises in the Sequoia National Park in the southwestern part of T. 18 S., R. 31 E., Mount Diablo base and meridian, at altitude 9,300 feet above sea level; flows, in general, west of south 14 miles to the southeastern part of T. 20 S., R. 30 E., where it receives the South Fork of the Middle Fork; below the Forks, the Middle Fork of the Tule flows southwestward to the point about 1 mile above Daunt post office, where it unites with the North Fork, and from this point the Tule flows, in general, southwestward to the Tulare Lake basin, which it enters about 5 miles east of Portersville; at low and moderate stages the total flow of the river is diverted for irrigation in the vicinity of Portersville; flood waters pass westward through old channels in the river's alluvial fan to Tulare Lake, south of Corcoran; principal tributary below the upper forks, South Fork.

Altitudes in the Tule basin range from 500 feet in the foothills to 10,000 feet along the eastern border; the western third is a typical foothill region, characterized by large, irregular, moderately high hills, separated by valleys. The eastern two-thirds is an eroded mountain region whose rather steep slopes have been carved by the action of primary and secondary stream systems. The rocks are chiefly granitic.

The mean annual precipitation is about 8 inches in the valley below the foothills, 20 inches in the middle part of the basin, and 30 inches or more on the upper levels where much of it occurs as snow. About two-thirds of the upper part of the basin supports a growth of grass, brush, and scattering timber; the moderate and higher elevations are covered with good timber and underbrush.

Gaging stations at Portersville (1878–1884), near Portersville (1901–1912).

Surveys and data: Kaweah sheet; Water-Supply Paper, U. S. Geol. Survey No. 271, 1911, pp. 178–179.

Tule River, Middle Fork. *See* Tule River.

Tule River, North Fork (R); Tulare County; Sequoia National Forest; rises in the southeastern part of T. 18 S., R. 30 E., Mount Diablo base and meridian, at altitude 9,000 feet above sea level; flows southwestward 10 miles, then southward 7 miles to the southeastern part of T. 20 S., R. 29 E., about 1 mile above Daunt post office, where it unites with the Middle Fork to form Tule River (tributary to Tulare Lake basin); fall, 8,000 feet, of which 4,000 feet occurs in the first 3 miles and 2,000 feet more in the next 3½ miles of its course; principal tributaries, Sycamore and Bear creeks. Kaweah sheet.

Tule River, Middle Fork, North Fork of. *See* Tule River.

Tule River, South Branch (L); the south channel by which flood waters from Tule River may reach Tulare Lake; leaves Tule River below Portersville and extends westward. Land Office map of California, 1907.

Tule River, South Fork (L); Tulare County; rises in the eastern part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows, in general, southwestward 8 miles, westward 8 miles, then northwestward 7

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miles to its junction with Tule River (tributary to Tulare Lake basin) in the southeastern part of T. 21 S., R. 28 E.; length, 23 miles; fall, 7,500 feet, of which 7,000 feet occurs in the first 12 miles; principal tributaries, Pigeon and Rocky creeks. Gaging station near Success (1910–1912). Kaweah sheet.

Tunemah Lake; Fresno County; Sierra National Forest; 1½ miles northwest of Tunemah Peak; outlet, a stream 2 miles long, flowing eastward to Goddard Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); altitude, 11,150 feet; fall of outlet, 3,600 feet. Mount Goddard sheet.

Tunis Creek (R); Kern County; rises on the northern slope of the Tehachapi Mountains, at altitude 6,000 feet above sea level; flows northwestward toward Buena Vista Lake Reservoir; drains an area composed of granitic mountains. Tejon sheet; Land Office map, 1907.

Tuolumne River (R); rises in numerous glacial lakes near the crest of the Sierra divide in Tuolumne County; flows southwestward to its junction with the San Joaquin, 10 miles west of Modesto; total length about 150 miles.

The principal headwater streams come from the glaciers and lakes on the northern slope of Mount Lyell to the north and east of the headwaters of Merced River; the course of the river is through beautiful upland meadows in its upper part, then through a canyon nearly 80 miles long which has been cut out of solid granite; the upper part of this canyon for a distance of about 25 miles is 3,000 to 4,000 feet deep and is known as the Grand Canyon of the Tuolumne. At the lower end of the Grand Canyon is Hetch Hetchy Valley, which is smaller than Yosemite Valley but in every other way resembles it very much. Finally the river passes through the lower canyon into the San Joaquin Valley, which it enters near La Grange. Nearly all the tributaries of Tuolumne River enter from the north. In order from east to west, the principal tributaries are Return, Rancheria, Falls, and Cherry creeks, Clavey River, North Fork of Tuolumne, and Woods Creek. South Fork of Tuolumne River enters the main stream from the south and receives as its principal tributary the Middle Fork.

Altitudes in this basin range from about 300 feet in the foothills to 13,000 feet along the crest of the Sierra divide. The upper part of the basin is practically devoid of forests. The middle reaches support a heavy growth of coniferous timber which becomes less dense with decrease in altitude; in the foothill region vegetation consists of grass, brush, and scattered timber; about 1,200 square miles of the upper part of the basin is included in national parks and forests.

Mean annual precipitation ranges from about 10 inches in the San Joaquin Valley to 30 inches in the foothill region, and probably 60 inches at the higher elevations; on the upper half of the basin precipitation occurs chiefly as snow, the greater part of which disappears in the spring. On the higher peaks much snow lasts until late summer; on the northern slope of Mount Lyell is one of the few glaciers still remaining in the Sierra.

The gradient of the Tuolumne is heavy and opportunities for water-power development are great, but the minimum flow of this stream is sufficient to afford only about 35,000 horsepower continuously without storage. Many of the high glacial lakes afford exceptional opportunities for constructing storage reservoirs and a number of storage sites also exist on the main river.

Water is diverted from the Tuolumne above Lagrange for irrigating large areas in the valley on both sides of the river.

Gaging stations at Lagrange (1895), at Modesto (1878–1897), at Hetch Hetchy Valley dam site (1901).

Surveys and data: Yosemite, Dardanelles, Big Trees, and Sonora sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 197–198.

Tuolumne River, Dana Fork (R); Tuolumne County; Yosemite National Park; rises on the southern slope of Mount Dana (altitude, 13,050 feet); flows westward 7

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miles to Tuolumne Meadows, where it unites with Lyell Fork to form Tuolumne River (tributary to San Joaquin River); fall, 2,400 feet; principal tributary, South Fork. Yosemite National Park map.

Tuolumne River, Dana Fork, South Fork (L); Tuolumne County; Yosemite National Park, rises in Helen Lake at altitude 10,896 feet above sea level; flows northward 2 miles to its junction with Dana Fork (tributary through Tuolumne River to San Joaquin River); fall, 1,896 feet. Yosemite National Park map.

Tuolumne River, Lyell Fork (L); Tuolumne County; Yosemite National Park; rises on the northern slope of Mount Lyell (altitude, 13,090 feet); flows northward and northwestward about 12 miles to its junction with Dana Fork, with which it forms Tuolumne River (tributary to San Joaquin River) in Tuolumne Meadows; fall, 3,000 feet. On the northern slope of Mount Lyell is one of the few glaciers remaining in the Sierras. Yosemite National Park map.

Tuolumne River, Middle Fork (R); Tuolumne County; Yosemite National Park; rises in the northwestern part of T. 1 S., R. 22 E., Mount Diablo base and meridian, at altitude 7,800 feet above sea level; flows very irregularly westward to the northwestern part of T. 1 S., R. 19 E., and then southwestward to its junction with the South Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); length, 27 miles; fall, 6,700 feet; principal tributary, Cottonwood Creek. Yosemite National Park map and Sonora sheet.

Tuolumne River, North Fork (R); Tuolumne County; Stanislaus National Forest; rises about 2½ miles north of the north line of T. 3 N., R. 18 E., Mount Diablo base and meridian, at altitude 5,600 feet above sea level; flows, in general, southwesterly 26 miles to its junction with Tuolumne River (tributary to San Joaquin River); fall, 4,100 feet; principal tributaries, Wright, Sugarpine, Basin Slope, and Hunter creeks. Gaging station near Tuolumne (1910–1912). Big Trees and Sonora sheets.

Tuolumne River, South Fork (L); Tuolumne County; Yosemite National Park; rises in the southeastern part of T. 1 S., R. 20 E., Mount Diablo base and meridian, at altitude 8,800 feet above sea level; flows very irregularly westward to its junction with Tuolumne River in the eastern part of T. 1 S., R. 17 E.; length, including major windings, 25 miles; fall, 7,000 feet; principal tributary, Middle Fork. The stream is fed by many short, branching tributaries heading well up toward the crests of the divides. The basin contains few lakes, only one being named on the map. Gaging station near Groveland (1910–1912). Yosemite National Park map and Sonora sheet.

Turnback Creek (R); Tuolumne County; rises near Sugarpine, in the northeastern part of T. 2 N., R. 16 E., Mount Diablo base and meridian, at altitude 4,300 feet above sea level; flows west of south 12 miles into Tuolumne River (tributary to San Joaquin River); fall, 3,100 feet; upper course, intermittent. Sonora and Big Trees sheets.

Twin Lake; Alpine County; Stanislaus National Forest; one-half mile southwest of East Blue Lake; outlet, a stream 1¼ miles long flowing through Meadow Lake to North Fork of Mokelumne River (tributary through Mokelumne River to the San Joaquin); altitude, 8,150 feet. Markleeville sheet.

Twin Lakes; Fresno County; southwestern part of T. 7 S., R. 26 E., on the north slope of Kaiser Ridge, 2 miles east of Kaiser Peak; outlet, one of the headwater streams of Kaiser Creek (tributary to San Joaquin River); altitude, about 8,600 feet; 2 small lakes connected by a small channel. Kaiser sheet.

Twin Lakes; Tulare County; Sequoia National Forest; at northeastern base of Mount Hitchcock, 1½ miles southwest of Mount Whitney; outlet, a stream three-fourths mile long, flowing north of west to Whitney Creek (tributary to Kern River); two small lakes connected by a short channel; the lower is 11,573 feet above sea level; the upper lake is 11,750 feet above sea level; fall of the outlet stream above Whitney Creek, 500 feet. Mount Whitney sheet.

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Twin Lakes; Tuolumne County; Yosemite National Park; 1 mile southwest of Bigelow Peak and 1 mile northwest of Kendrick Peak; two long, narrow lakes connected by a channel one-half mile long; the upper lake receives two inflowing streams, one from Bigelow and one from Kendrick Peak; outlet, East Fork of Eleanor Creek through Eleanor Creek to Cherry Creek (tributary through Tuolumne River to the San Joaquin); altitude of upper lake, 8,850 feet; of lower lake, 8,750 feet; the upper lake is about 1 mile long and the lower, 1½ miles; each is one-fourth mile in maximum width. Yosemite National Park map.

Twomile Creek (R); Tuolumne County; Stanislaus National Forest; rises in the southern part of T. 3 N., R. 18 E., at altitude 5,900 feet above sea level; flows southwestward 4 miles, then southeastward 1½ miles into Clavey River (tributary through Tuolumne River to the San Joaquin); fall, 1,800 feet. Big Trees sheet.

Tyndall Creek (L); Tulare County; Sierra National Forest; rises in the western part of the Sierra Divide, between Junction Peak and Mount Tyndall, at altitude 12,000 feet above sea level; flows southwestward 7 miles into Kern River; fall, 2,500 feet. Mount Whitney sheet.

Unicorn Creek (L); Tuolumne County; Yosemite National Park; rises in the central part of T. 1 S., R. 24 E., Mount Diablo base and meridian, in Elizabeth Lake, east of Unicorn Peak (altitude, 10,848 feet); flows northward 2 miles into Tuolumne River (tributary to San Joaquin River); fall, 1,000 feet. Yosemite National Park map.

Van Gordon Creek (R); Tulare County; rises in the western part of T. 18 S., R. 29 E., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows southwestward 6 miles into Yokohle Creek (tributary through Kaweah River to Tulare Lake basin); fall, 2,000 feet; intermittent. Kaweah sheet.

Van Horn Creek (R); Eldorado County; rises in the southern part of T. 10 N., R. 14 E., Mount Diablo base and meridian, at altitude 5,900 feet above sea level; flows southwestward 3 miles into North Fork of Cosumnes River (tributary through Cosumnes River to the Mokelumne and thus to the San Joaquin); fall, 1,200 feet. Pyramid Peak sheet.

Vasquez Creek (R); San Benito County; rises in the east central part of T. 14 S., R. 9 E., on Red Peak; flows north of east 6 miles into Mercer Creek (to San Joaquin Valley). Land Office map of California, 1907.

Vernon Lake; Tuolumne County; Yosemite National Park, eastern part of T. 2 N., R. 20 E., Mount Diablo base and meridian; inlet, Falls Creek; outlet, Falls Creek to Tuolumne River (tributary to San Joaquin River); altitude, 6,600 feet; fall of Falls Creek in 4½ miles below Vernon Lake, 2,900 feet; length, about three-fourths mile; maximum width, one-third mile. Yosemite National Park map.

Vidette Creek (L); Tulare County; rises in Sierra National Forest, on the north slope of Deerhorn Mountain, at altitude 12,000 feet above sea level; flows northward 3 miles between east and west spurs, passing through several lakes to its junction with Bubbs Creek (tributary to South Fork of Kings River); fall, 2,100 feet. Mount Whitney sheet.

Virginia Lake; Tuolumne County; Yosemite National Park; northeastern part of T. 1 N., R. 23 E., Mount Diablo base and meridian; outlet, a stream one-half mile long, flowing northwestward to Return Creek (tributary through Tuolumne River to San Joaquin River); altitude, 9,200 feet above sea level; fall of outlet, 1,600 feet. Yosemite National Park map.

Volcanic Lakes; Fresno County; Sierra National Forest; northeast slope of Combs Spur, one-half mile southeast of Dead Pine Ridge; six or eight glacial lakelets, which discharge through the West Fork of Dougherty Creek (tributary through Middle Fork of Kings River to Kings River and thus to the San Joaquin); the highest of the

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lakes is 10,250 feet above sea level, the lowest is 10,150 feet; four of the lakes form the head of the West Fork, the others discharge to the West Fork by a northward-flowing stream 1½ miles long. Tehipite sheet.

Wah-to-ke Creek (L); rises in the southeastern part of T. 13 S., R. 24 E., Mount Diablo base and meridian; flows southwestward into the reservoir 5 miles northeast of Reedley; only flood waters reach Kings River. Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Waltham Creek (R); Fresno County; rises in the western part of T. 20 S., R. 13 E.; flows, in general, southeastward 14 miles, then northeastward 10 miles to its junction with Los Gatos Creek at Coalinga. Fisk and Johnson map; called Walthan Creek on the Land Office map of California, 1907.

Wanda Lake; Fresno County; Sierra National Forest, north slope of Goddard Divide, 1 mile southwest of Mount Huxley and 2 miles northeast of Mount Goddard; two inlets, one draining two small lakes; outlet, Evolution Creek through Evolution Lake to South Fork of San Joaquin River (head of San Joaquin); elevation above sea level, 11,452 feet; above Evolution Lake, 462 feet. Mount Goddard sheet.

Warm Creek (R); Fresno County; rises in Warm Creek Meadow, 4 miles south of Saddle Mountain, at altitude 7,800 feet above sea level; flows southwestward 3 miles into South Fork of San Joaquin River; fall, 1,600 feet. Kaiser sheet.

Washburn Lake; Madera County; southern part of T. 2 S., R. 24 E.; inlet, Merced River; outlet, Merced River to the San Joaquin; altitude 7,640 feet. Mount Lyell sheet.

Washington Gulch Creek (L); Stanislaus County; rises in the southwestern part of T. 5 S., R. 6 E.; flows southeastward into El Puerto Creek (to San Joaquin Valley); length, 4 miles. Orestimba-Panoche-Cantua special map.

Water Gulch Creek (L); Madera County; rises in the eastern part of T. 8 S., R. 20 E., Mount Diablo base and meridian, at altitude 2,300 feet above sea level; flows southwestward 3 miles into Fresno River (tributary to San Joaquin River); fall, 800 feet. Mariposa sheet.

Watts Creek (R); Fresno County; rises in the western part of T. 11 S., R. 24 E., Mount Diablo base and meridian; flows southeastward 8 miles into Sycamore Creek (tributary to Kings River and thus to the San Joaquin). Land Office map of California, 1907; Le Conte's map of portion of the Sierra Nevada of central California, No. 3, Kings-Kern sheet, March, 1903.

Weaver Lake; Tulare County; Sequoia National Forest; eastern part of T. 14 S., R. 29 E., Mount Diablo base and meridian; outlet, a stream 1½ miles long flowing northwestward into Big Meadow Creek (tributary through Boulder Creek to South Fork of Kings River and thus through Kings River to the San Joaquin); altitude, 8,700 feet; fall of outlet, 1,200 feet. Tehipite sheet.

Wells Creek (L); Tulare County; Sequoia National Forest; rises in the western part of T. 18 S., R. 29 E., Mount Diablo base and meridian, at altitude 2,200 feet above sea level; flows westward 2½ miles into Jim Gray Creek (tributary through Horse Creek to Kaweah River and thus to Tulare Lake basin); fall, 900 feet. Kaweah sheet.

West Fork or **Branch**. See name of main stream.

Whiskey Creek (L); Madera County; rises in the southeastern part of T. 7 S., R. 23 E., in Cold Spring Meadow, on the west slope of Whiskey Ridge, at altitude 6,500 feet above sea level; flows west of south to its junction with North Fork of San Joaquin River; length, 11 miles; fall, 4,850 feet. Kaiser sheet.

White Creek (R); Fresno County; rises in the southwestern part of T. 18 S., R. 14 E.; flows southeastward 6 miles into Los Gatos Creek. Gaging station at base of foothills (1878–1884). Land Office map of California, 1907.

White Fork (R); Fresno County; rises in Sierra National Forest, 2 miles southwest of Mount Pinchot, at altitude 12,000 feet above sea level; flows southward 3 miles into

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Woods Creek (tributary to South Fork of Kings River, a tributary of San Joaquin River); fall, 2,800 feet. Mount Whitney sheet.

White Mans Ravine Creek (L); Eldorado County; rises in the eastern part of T. 8 N., R. 9 E., Mount Diablo base and meridian, at altitude 900 feet above sea level; flows southeastward 1 mile into Hungry Hollow Creek (tributary through Indian Creek to Big Canyon Creek and thus through Cosumnes and Mokelumne rivers to the San Joaquin); fall, 500 feet. Placerville sheet.

White River (R); Tulare County; rises in the eastern part of T. 24 S., R. 31 E., Mount Diablo base and meridian; flows westward into San Joaquin Valley south of Deer Creek; sinks before reaching Tulare Lake basin. Gaging station near Hot Springs (1911–12). Land Office map of California, 1907.

Whitney Creek (L); Tulare County; Sequoia National Forest; rises on the north slope of Mount Whitney (altitude, 14,501 feet); flows, in general, southwestward 7 miles to its junction with Kern River in the Kern River canyon; fall, 4,800 feet, of which 2,300 feet is made in the last 1½ miles; principal tributary, Crabtree Creek and a stream from Twin Lakes. Mount Whitney sheet.

Wild Cat Creek (L); Merced County; rises in the southwestern part of T. 12 S., R. 10 E.; flows northeastward into San Joaquin Valley; length, 6 miles; carries water only during the rainy season. Land Office map of California, 1907.

Willow Creek (L); Amador and Sacramento counties; rises in the western part of T. 7 N., R. 10 E., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows southwestward and discharges into Cosumnes River (tributary through Mokelumne River to the San Joaquin) through Willow Slough; length to junction of Willow Slough with Cosumnes River, 35 miles; fall, 950 feet, of which 900 feet occurs in the 16 miles above the valley. Jackson and Lodi sheets.

Willow Creek (R); Calaveras County; rises in the northwestern part of T. 4 N., R. 13 E., Mount Diablo base and meridian, at altitude 2,200 feet above sea level; flows southwestward 7 miles, then southeastward 1 mile into Calaveritas Creek (tributary through South Fork of Calaveras River to Calaveras River and thus to the San Joaquin); fall, 1,200 feet. Jackson sheet.

Willow Creek (L); Madera County; rises in the western part of T. 6 S., R. 23 E., in Chilkoot Lake, at altitude 7,500 feet above sea level; flows southwestward about 5 miles to its junction with North Fork of San Joaquin River in T. 6 S., R. 22 E.; fall, 3,000 feet. Kaiser and Mariposa sheets; map of Sierra Nevada of central California, publication No. 12 of the Sierra Club, January, 1896.

Willow Creek (L); Madera County; rises in the southeastern part of T. 6 S., R. 22 E., on the west slope of Graham Mountain, at altitude 5,700 feet above sea level; flows west of south 3 miles into North Fork of San Joaquin River, at the upper end of Crane Reservoir; fall, 2,400 feet. Mariposa sheet.

Willow Creek (L); Madera County; rises in the western part of T. 8 S., R. 20 E., at altitude about 1,700 feet above sea level; flows, in general, northwestward 5 miles into Chowchilla River (tributary to the San Joaquin); fall, 1,000 feet. Mariposa sheet.

Willow Creek (R); Madera County; rises in the western part of T. 9 S., R. 21 E., on the northeastern slope of Blackhawk Mountain, at altitude 1,800 feet above sea level; flows, in general, southeastward 7 miles to its junction with Fine Gold Creek (tributary to San Joaquin River), in the eastern part of T. 10 S., R. 21 E.; fall, 1,000 feet. Mariposa sheet.

Willow Creek (R); Tulare County; Sequoia National Forest; rises in the southeastern part of T. 17 S., R. 32 E., Mount Diablo base and meridian, at altitude 11,500 feet above sea level; flows northeastward 3 miles into Big Arroyo (tributary to Kern River); fall, 3,700 feet. Olancha sheet.

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Willow Slough (L); Sacramento County; west side of Cosumnes River; the channel through which Willow Creek discharges its flood waters to the Cosumnes and thus through the Mokelumne to the San Joaquin. Lodi sheet.

Wilmer Lake; Tuolumne County; Yosemite National Park, just west of south end of Bailey Ridge; inlet, Falls Creek; outlet, Falls Creek to Tuolumne River (tributary to San Joaquin River); length, one-half mile; maximum width, one-fourth mile. Yosemite National Park map.

Wilson Creek (L); Tulare County; Sequoia National Forest; rises in the west central part of T. 21 S., R. 31 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows east of north 3 miles into South Fork of Middle Fork of Tule River (tributary through Middle Fork of Tule River to Tule River and thus to Tulare Lake basin); fall, 2,500 feet. Kaweah sheet.

Wilson Creek (R); Tuolumne County; Yosemite National Park; rises in the northeastern part of T. 2 N., R. 23 E., Mount Diablo base and meridian, on Doghead Peak, at altitude 10,500 feet above sea level; flows southwestward 2½ miles, then southeastward 2 miles into Matterhorn Canyon Creek (tributary through West Fork of Return Creek to Return Creek and thus through Tuolumne River to San Joaquin River); fall, 1,500 feet. Yosemite National Park map.

Windy Canyon Creek (L); Fresno County; Sierra National Forest; rises on the north slope of Windy Ridge, at altitude 10,500 feet above sea level; flows, in general, northwestward into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); length, 4 miles; fall, 4,400 feet. Tehipite sheet.

Wolverton Creek (L); Tulare County; Sequoia National Park; rises in the southern part of T. 15 S., R. 30 E., Mount Diablo base and meridian, on the northern slope of Panther Peak, at altitude 8,700 feet above sea level; flows northwestward 1 mile, then westward 2 miles into Marble Fork of Kaweah River (tributary through Middle Fork of Kaweah River to Kaweah River and thus to Tulare Lake basin); fall, 2,300 feet. Tehipite sheet.

Woodchuck Creek (L); Fresno County; rises in the eastern part of T. 10 S., R. 28 E., at altitude 10,300 feet above sea level; flows, in general, west of south 2½ miles, then north of west 5 miles; into North Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 3,500 feet; principal tributary, stream from Woodchuck Lake. Mount Goddard sheet.

Woodchuck Lake; Fresno County; Sierra National Forest; eastern part of T. 10 S., R. 28 E., Mount Diablo base and meridian; outlet, a stream 3 miles long, flowing very irregularly southwestward into Woodchuck Creek (tributary to North Fork of Kings River and thus through Kings River to the San Joaquin); altitude, 9,850 feet; fall of outlet, 1,700 feet. Mount Goddard sheet.

Woods Creek (L); Fresno County; rises in Sierra National Forest, in Woods Lake, at altitude 10,669 feet above sea level; flows northwestward 1½ miles, then southwestward 2½ miles, then almost directly west 4 miles to its junction with South Fork of Kings River (tributary to San Joaquin River); fall, about 3,600 feet; principal tributaries, White Fork and South Fork, the latter draining many small lakes; in all, this basin contains nearly 100 glacial lakes. Mount Whitney and Tehipite sheets.

Woods Creek (R); Tuolumne County; western part; rises 2 miles northeast of Columbia at altitude 2,000 feet above sea level; flows southward 6 miles, southwestward 4 miles, then southeastward 8 miles to its junction with Tuolumne River (tributary to San Joaquin River) near Jacksonville; fall, 800 feet; principal tributaries, Sonora and Sullivan creeks. Big Trees and Sonora sheets.

Woods Creek, South Fork (L); Fresno County; rises in Sierra National Forest, just north of Mount Rixford (altitude, 12,856 feet); flows west of north 7 miles, passing through many lakes to its junction with Woods Creek (tributary through South Fork of Kings River to San Joaquin River); fall, 3,000 feet; principal tributary, Baxter

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Creek. The basin of this creek, although less than 8 miles long and only 5 miles in maximum width, contains more than 50 lakes; the western part of it is called Sixty Lake Basin. Mount Whitney sheet.

Woods Lake; Fresno County; Sierra National Forest; inlets, several streams draining small glacial lakes; outlet, Woods Creek to South Fork of Kings River (tributary to San Joaquin River); altitude, 10,669 feet; fall of outlet, 3,600 feet. Mount Whitney sheet.

Wren Creek (L); Fresno County; Sierra National Forest; rises in the southeastern part of T. 12 S., R. 29 E., Mount Diablo base and meridian, on the north slope of Wren Peak, at altitude 8,500 feet above sea level; flows northwestward 3 miles into Middle Fork of Kings River (tributary through Kings River to the San Joaquin); fall, 5,000 feet. Tehipite sheet.

Wright Creek (L); rises in the western part of T. 3 N., R. 18 E., Mount Diablo base and meridian, at altitude 5,800 feet above sea level; flows southwestward 5 miles and north of west 1½ miles into North Fork of Tuolumne River (tributary through Tuolumne River to the San Joaquin); fall, 1,900 feet. Big Trees sheet.

Yokohle Creek (L); Tulare County; rises in the western part of T. 19 S., R. 29 E., Mount Diablo base and meridian, on the western slope of Blue Ridge, at altitude 4,000 feet above sea level; flows westward 10 miles, then northwestward 3 miles; carries water to Kaweah River, to which its basin is topographically tributary, only in times of flood. Kaweah sheet; Land Office map of California, 1907.

Yosemite Creek (R); Mariposa County; Yosemite National Park; rises in the southern part of T. 1 N., R. 22 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level, close to the summit of the divide separating the Merced from the Tuolumne River basin; flows somewhat west of south 12 miles to its junction with Merced River (tributary to San Joaquin River) in Yosemite Valley; it enters the valley by a precipitous fall, descending 2,700 feet in the last half mile of its course above the valley; of this 2,700 feet, 1,100 feet is made at the famous Yosemite Falls, the upper part of the stream is fed by many small branching tributaries. Gaging station in Yosemite Valley (1904–1909). Yosemite National Park map.

Young Lake; Tuolumne County; Yosemite National Park; central part of T. 1 N., R. 24 E., Mount Diablo base and meridian, just north of Ragged Peak; outlet, a stream one-half mile long, flowing northward to a south fork of Conness Creek (tributary through Tuolumne River to San Joaquin River); altitude, 9,850 feet; fall of outlet, 600 feet. Yosemite National Park map.

Zapatos Creek. *See* Polvadero Creek.

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GAGING STATIONS MAINTAINED IN THE SAN JOAQUIN RIVER BASIN FROM 1878 TO JULY 1, 1912.

The following list comprises the gaging stations that have been maintained in the San Joaquin River basin. Stream-flow data for these stations are published in Water-Supply Paper 299. (See p. 3.) The stations are arranged in downstream order, tributaries being indicated by indention. A dash following the date implies that the station was being maintained July 1, 1912:

San Joaquin River near Friant, 1907–.
San Joaquin River at Hamptonville, 1878–1884.
San Joaquin River at Herndon, 1870–1910.
San Joaquin River near Newman, 1912–.
    Tulare Lake basin:
        Tulare Lake in Kings County, 1906–.
        Kern River at Isabella, 1910–.
        Kern River Power Co.'s canal near Kernville, 1878–1884, 1912–.
        Kern River at Rio Bravo ranch, 1893–1911.
        Kern River near Bakersfield, 1911–.
            South Fork of Kern River near Onyx, 1911–.
            South Fork of Kern River near Isabella, 1910–.
            Erskine Creek near Isabella, 1911–.
        Caliente Creek at base of foothills, 1911.
            Basin Creek near Havalah, 1911–.
        Tejon House creek at Tejon ranch house, 1895–96.
        San Emigdio Creek at San Emigdio ranch house, 1894–95.
        Poso Creek at base of foothills, 1878–1884.
        White Creek at base of foothills, 1878–1884.
        White River near Hot Springs, 1911–.
        Deer Creek at base of foothills, 1878–1884.
        Deer Creek near Hot Springs, 1910–.
            Tyler Creek[1] near Hot Springs, 1911–.
        Tule River at Portersville, 1878–1884.
        Tule River near Portersville, 1901–.
            Bear Creek near Daunt, 1911–.
            South Fork of Tule River near Success, 1910–.
        Kaweah River at Wachumna Hill, 1878–1884.
        Kaweah River below Three Rivers, 1903–.
            North Fork of Kaweah River at Kaweah, 1910–.
            South Fork of Kaweah River near Three Rivers, 1911–.
        Kings River at Suspension Bridge, 1895.
        Kings River near Sanger, 1895–.
        Kings River at Slate Point, 1878–1884.

[1] Not named on the map.

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San Joaquin River—Continued.
- Tulare Lake basin—Continued.
  - Kings River at Kingsburg, 1895–1904.
    - North Fork of Kings River:
      - Dinkey Creek near Ockenden, 1910–.
      - Big Creek near Tollhouse, 1910–.
        - Rush Creek near Ockenden, 1910–.
- Fresno River at base of foothills, 1878–1884.
- Fresno River near Knowles, 1911–
  - Melder Creek near Fresno Flats, 1910–
  - North Fork of Fresno River near Sugarpine, 1910–
- Chowchilla Creek at base of foothills, 1878–1884.
- Mariposa Creek at base of foothills, 1878–1884.
- Bear Creek at base of foothills, 1878–1884.
- Merced River near Yosemite, 1904–1909, 1912–
- Merced River above Merced Falls, 1901–
- Merced River near Newman, 1912–
- Merced River at Merced Falls, 1878–1884.
  - Tenaya Creek near Yosemite, 1904–1909, 1912–
  - Yosemite Creek near Yosemite, 1904–1909, 1912–
  - South Fork of Merced River near Wawona, 1910–
    - Big Creek near Wawona, 1910–
- Tuolumne River at Hetch Hetchy Valley dam site, 1901.
- Tuolumne River near Lagrange, 1895–
  - Modesto Canal near Lagrange, 1903–
  - Turlock Canal near Lagrange, 1899–
  - Lagrange Water & Power Co.'s canal near Lagrange, 1907–
- Tuolumne River at Modesto, 1878–1884, 1895–1897.
  - Cherry Creek at Eleanor trail crossing, 1901.
    - Eleanor Creek at Eleanor trail crossing, 1901.
    - Eleanor Creek below Eleanor Lake, 1910–
  - Jawbone Creek near Tuolumne, 1910–
  - Corral Creek near Groveland, 1910–
  - South Fork of Tuolumne River near Groveland, 1910–
  - Clavey River near Tuolumne, 1910–
    - Indian Creek near Tuolumne, 1910–
  - North Fork of Tuolumne River near Tuolumne, 1910–
    - Hunter Creek near Tuolumne, 1910–
- Stanislaus River at Knights Ferry, 1904–
  - Stanislaus Water Co.'s canal at Knights Ferry, 1904–
  - Stanislaus River at Oakdale, 1895–1900.
  - Stanislaus and San Joaquin Water Co.'s canal at Knights Ferry, 1910–
  - Rose Creek near Jupiter, 1910–
    - Knight Creek near Jupiter, 1910–
    - South Fork of Stanislaus River near Confidence, 1911–
    - South Fork of Stanislaus River near Columbia, 1910–
- Calaveras River at Jenny Lind, 1907–
- Calaveras River near Bellota, 1878–1884.
- Mokelumne River at Electra, 1901, 1903, 1904.
- Mokelumne River at Lone Star Mills, 1878–1884.
- Mokelumne River near Clements, 1904–
- Mokelumne River near Lodi, 1895.

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San Joaquin River—Continued.
Mokelumne River—Continued.
Middle Fork of Mokelumne River near Westpoint, 1912–
South Fork of Mokelumne River near Railroad Flat, 1912–
Licking Fork near Railroad Flat, 1912–
Dry Creek at base of foothills, 1878–1884.
Dry Creek near Ione, 1911–
North Fork of Cosumnes River (head of Cosumnes River) near Eldorado, 1911–
Cosumnes River at Michigan Bar, 1907–
Cosumnes River below Michigan Bar, 1878–1884.

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 297

GAZETTEER OF SURFACE WATERS OF CALIFORNIA

PART III. PACIFIC COAST AND GREAT BASIN STREAMS

PREPARED UNDER THE DIRECTION OF JOHN C. HOYT

BY

B. D. WOOD

In cooperation with the State Water Commission and the Conservation Commission of the State of California

WASHINGTON
GOVERNMENT PRINTING OFFICE
1913

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NOTE.

A complete list of the gaging stations maintained on streams in the Great Basin and the streams tributary to the Pacific Ocean from 1888 to July 1, 1912, is presented on pages 241–244.

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GAZETTEER OF SURFACE WATERS IN THE PACIFIC COAST DRAINAGE BASINS AND THE GREAT BASIN, CALIFORNIA.

By B. D. Wood.

INTRODUCTION.

This gazetteer is the third of a series of reports on the surface waters of California prepared by the United States Geological Survey under cooperative agreement with the State of California as represented by the State Conservation Commission, George C. Pardee, chairman; Francis Cuttle; and J. P. Baumgartner, and by the State Water Commission, Hiram W. Johnson, governor; Charles D. Marx, chairman; S. C. Graham; Harold T. Powers; and W. F. McClure. Louis R. Glavis is secretary of both commissions. The reports are published as Water-Supply Papers 295 to 300 and bear the following titles:

295. Gazetteer of surface waters of California, Part I, Sacramento River basin.
296. Gazetteer of surface waters of California, Part II, San Joaquin River basin.
297. Gazetteer of surface waters of California, Part III, Great Basin and Pacific coast streams.
298. Water resources of California, Part I, Stream measurements in the Sacramento River basin.
299. Water resources of California, Part II, Stream measurements in the San Joaquin River basin.
300. Water resources of California, Part III, Stream measurements in the Great Basin and Pacific coast river basins.

The gazetteers embrace descriptions of all the streams named on the maps shown by the following list:

Maps covering areas drained by streams flowing to the Great Basin or to the Pacific Ocean.

Topographic sheets of the United States Geological Survey.[1]

Alturas.	Camulos.	Cucamonga.
Anaheim.	Capistrano.	Cuyamaca.
Antioch.	Carquinez.	Deep Creek.
Arroyo Grande.	Cayucos.	Downey.
Ballarat.	Concord.	Elcajon.
Calabasas.	Corona.	Elsinore.

[1] An index map showing the area covered by each sheet may be obtained by applying to the Director, United States Geological Survey, Washington, D. C.

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Maps covering areas drained by streams flowing to the Great Basin or to the Pacific Ocean—Continued.

Topographic sheets of the United States Geological Survey—Continued.

Escondido.
Fernando.
Furnace Creek.
Goleta special.
Guadalupe.
Hawthorne.
Haywards.
Hesperia.
Holtville.
Honey Lake.
Hueneme.
Indio special.
Ivanpah.
La Jolla.
Las Bolsas.
Las Vegas.
Lida.
Lompoc.
McKittrick.
Markleeville.
Modoc Lava Bed.
Mount Diablo.
Mount Hamilton.
Mount Lyell.
Mount Pinos.
Mount Whitney.
Napa.
Oceanside.
Olancha.
Palo Alto.
Parker.
Pasadena.
Pleasanton.
Pomona.
Port Harford.
Pyramid Peak.
Ramona.
Red Bluff.
Redding.
Redondo.
Riverside.
Rock Creek.
Salinas Valley.
Salton Sink.
San Antonio.
San Bernardino.
San Diego.
San Francisco.
San Gorgonio.
San Jacinto.
San Jose.
San Luis.
San Luis Obispo.
San Luis Rey.
San Mateo.
San Pedro.
Santa Ana.
Santa Barbara special.
Santa Cruz.
Santa Monica.
Santa Paula.
Santa Susana.
Santa Ynez.
Shasta.
Sierraville.
Tamalpais.
Tejon.
Tesla.
Truckee.
Tujunga.
Vacaville.
Ventura.
Wellington.
Yosemite National Park.
Yuma.

County maps.[1]

Del Norte County.
Eldorado and Amador counties.
Glenn County.
Humboldt County.
Mendocino County.
Mendocino and Lake counties.
Napa and Solano counties.
Nevada County.
Placer County.
Plumas County.
Siskiyou County.
Sonoma and Marin counties.
Trinity County.

For areas not covered by topographic sheets or by county maps the Land Office map of California, edition of 1907, has been used.

Each stream is described as rising near the point at which its beginning—that is, the head of the upper tributary apparently draining the largest area—is shown on the map, and the elevation of that point is given as the elevation of the source. It is of course recognized that this method does not give results of great precision, but it probably causes no greater errors in the determination of length and fall than would be caused by extending each stream to the head of the divide between its basin and that of the adjoining streams. It should be understood, however, that all statements of elevation, length, and fall are merely approximate.

[1] Published by Punnett Brothers.

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Except where otherwise stated, the descriptions are based only on the maps, and they vary in accuracy as the maps vary. Hundreds of the watercourses shown and named on the maps, particularly those in the southern and eastern parts of the State, are for by far the greater part of each year streams by courtesy only. During the rainy season or after an occasional "cloudburst" the channels may be filled to overflowing; at all other times they are dry. On the topographic sheets published by the United States Geological Survey such watercourses are as a rule indicated by a dotted blue line, and in the gazeteer they are characterized as "intermittent." The other maps used make no distinction between perennial and intermittent streams, and the "intermittent" has doubtless been omitted from many of the descriptions to which it properly belongs. Free use has been made of the descriptive matter in Wm. Ham. Hall's report on "Irrigation in southern California," published as part 2 of the report of the State engineer, Sacramento, 1888.

No systematic attempt has been made to correlate the names used on the county maps with those applied to the same streams on the Land Office map, but variations incidentally noted have been recorded. The names on the topographic sheets have been accepted as authoritative.

GAZETTEER.

Abel Canyon Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising on the west slope of McPherson Peak in Santa Barbara National Forest and flowing southwestward into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific Ocean). Santa Ynez sheet.

Ackermans Creek; Mendocino County; rises in the western part of T. 16 N., R. 13 W., Mount Diablo base and meridian; flows southward 3 miles, then eastward 8 miles to its junction with Russian River (which discharges to the Pacific Ocean) 2 miles north of Ukiah. Punnett's map of Menodcino County.

Adams Canyon Creek; Ventura County; rises in the northeastern part of Ex Mission San Buenaventura; flows southward toward Santa Clara River (tributary to the Pacific Ocean); length, about 4½ miles; fall above edge of the valley, about 700 feet; tributary, Salt Marsh Canyon Creek. Santa Paula sheet.

Agnew Lake; Mono County, Mono National Forest; southwestern part of T. 2 S., R. 26 E., Mount Diablo base and meridian; inlet, Rush Creek; outlet, Rush Creek, which discharges to Mono Lake; altitude, 8,650 feet; fall of Rush Creek in the one-fourth mile between Gem Lake and Agnew Lake, 380 feet. Mount Lyell sheet.

Agua Alta Creek; Riverside County; an intermittent stream, 3 miles long, rising on the south slope of Martinez Mountain and flowing southeastward toward Martinez Canyon, which opens to the Colorado Desert. Indio special sheet.

Agua Blanca Creek; Ventura County; formed in the central part of T. 6 N., R. 19 W., San Bernardino base and meridian, by two forks, one of which drains the eastern slope of McDonald Peak, and the other, the western slope of White Mountain; flows southeastward to its junction with Piru Creek (tributary to Santa Clara River, which discharges to the Pacific Ocean); length to head of longest fork, 12 miles, in which distance the fall is 4,300 feet. Tejon sheet.

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Agua Caliente Canyon Creek; Santa Ynez River basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the west slope of Hildreth Peak, at altitude 4,500 feet above sea level; flows somewhat west of south 7 miles into Santa Ynez River, which discharges to the Pacific Ocean; fall, 2,900 feet. Santa Ynez sheet.

Agua Caliente Canyon Creek; Sonoma Creek basin; Sonoma County; rises in the western part of T. 6 N., R. 5 W., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows southwestward about 4 miles; carries water to Sonoma Creek (tributary to San Pablo Bay) only at flood stages. Napa sheet.

Agua Caliente Creek; Coyote River basin; Alameda County; rises in the central part of T. 5 S., R. 1 E., Mount Diablo base and meridian, south of Mission Peak, at altitude 2,500 feet above sea level; flows northwestward 1 mile, then southwesterly to Mud Slough in the tidal marsh through which Coyote River enters San Francisco Bay; length, about 6 miles. Pleasanton and San Jose sheets.

Agua Caliente Creek; San Luis Rey River basin; San Diego County; rises in the southwestern part of T. 9 S., R. 4 E., San Bernardino base and meridian, at altitude 4,800 feet above sea level; flows southwestward and westward to San Luis Rey River, which discharges to the Pacific Ocean; intermittent; length, about 10 miles; fall, about 2,000 feet; connected with the channel of San Luis Rey River in San Jose Del Valle Rancho by a broad sandy wash. Ramona sheet.

Agua Dulce Creek; Los Angeles County; rises in the southeastern part of T. 5 N., R. 14 W., San Bernardino base and meridian, at altitude 2,450 feet above sea level; flows west of south to Santa Clara River (tributary to the Pacific Ocean), which it enters in Soledad Canyon; length, 3½ miles; fall, about 500 feet; principal tributary, Escondido Canyon Creek; intermittent. Fernando sheet.

Agua Fria Creek; Alameda County; a stream, about 5 miles long, rising half a mile north of Monument Peak; flows westward and southwestward to Mud Slough in the tidal marsh through which Coyote River enters San Francisco Bay. San Jose sheet.

Agua Hedionda Creek; San Diego County; rises in the central part of T. 11 S., R. 3 W., San Bernardino base and meridian, on the southern slope of San Marcos Mountains, at altitude about 1,000 feet above sea level; flows southwestward 7 miles, then somewhat north of west to the brackish-water marsh about 1 mile southeast of Carlsbad; intermittent. This marsh is separated from the Pacific by a narrow sand bar which may be cut through by the flood waters of the creek. Escondido and Oceanside sheets.

Ah-Pah Creek; Humboldt County; rises in the southwestern part of T. 12 N., R. 2 E., Humboldt base and meridian; flows northeastward 4 miles into Klamath River (tributary to the Pacific). Punnett's map of Humboldt County.

Alameda Creek; Santa Clara and Alameda counties; rises in the southeastern part of T. 6 S., R. 3 E., Mount Diablo base and meridian, on the north slope of Packard Ridge, at altitude 2,900 feet above sea level; takes a general northwesterly course to a point 1 mile west of Sunol in Alameda County, whence it winds very irregularly westward to San Francisco Bay; including its major windings, the creek is about 40 miles long; principal tributaries, Arroyo Hondo, Calaveras, Welch, San Antonio, and Alamo creeks, which drain a large area lying east of Alameda Canyon; below Niles the creek divides, one channel carrying water directly to San Francisco Bay, and the other, called Sanjen de los Alisos, passing southwestward to Beard Creek, which flows

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through the tidal marsh at the southeast end of the bay. Mount Hamilton, San Jose, Pleasanton, and Haywards sheets.

Alamo Canyon Creek; Santa Maria River basin; Santa Barbara County; rises in the Santa Barbara National Forest, 4 miles northeast of Big Pine Mountain, at altitude 4,800 feet above sea level; flows northeastward and eastward into Santa Barbara Canyon Creek (tributary to Cuyama River, Santa Maria River, which discharges to the Pacific Ocean), length, 4 miles; fall, 1,500 feet. Santa Ynez sheet.

Alamo Creek; Alameda Creek basin; Contra Costa and Alameda counties; rises in Contra Costa County, in the southern part of T. 1 S., R. 1 E., Mount Diablo base and meridian, near the southeastern end of Black Hills, at altitude 1,150 feet above sea level; flows west of south about 9 miles to Amador Valley, where it joins Arroyo de la Laguna (tributary to Alameda Creek, which discharges to San Francisco Bay); fall, 850 feet; principal tributary, West Branch; intermittent in the valley. Mount Diablo and Pleasanton sheets.

Alamo Creek; Santa Clara River basin; Ventura County; rises in the southeastern part of T. 7 N., R. 20 W., San Bernardino base and meridian, on the west slope of Alamo Mountain, at altitude 6,700 feet above sea level; flows northwestward into Mutau Creek (tributary to Piru Creek and thus to Santa Clara River, which discharges to the Pacific); length, about 4 miles; fall, 2,100 feet. Tejon and Mount Pinos sheets.

Alamo Creek; Santa Maria River basin; Ventura County; rises in the northern part of T. 6 N., R. 22 W., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows irregularly northward and northwestward into Cuyama River (Santa Maria River, which discharges to the Pacific Ocean); length, about 6 miles; fall, 2,000 feet. Mount Pinos sheet.

Alamo Creek, West Branch; Alameda Creek basin; Contra Costa County; rises in the western part of T. 1 S., R. 1 E., Mount Diablo base and meridian, on the northern slope of the Black Hills, at altitude 1,550 feet above sea level; flows in general west of south to its junction with Alamo Creek (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay) in San Ramon Rancho; length, about 7½ miles; fall, 1,000 feet. Mount Diablo and Pleasanton sheets.

Alamo Pintado Creek; Santa Barbara County; an intermittent southward-flowing stream tributary to Santa Ynez River (tributary to the Pacific Ocean) near Santa Ynez Mission. Lompoc sheet.

Alamo River; Riverside County; extends northward from the Imperial Canal in the southern end of Imperial Valley to Salton Sea; carries the waste water from the irrigation system and the power plant. The river occupies a channel which had been one of the distributaries of Colorado River during the formation of its delta. Gaging station near Brawley (1908–1912). Land Office map of California, 1907; Water-Supply Paper U. S. Geol. Survey No. 251, 1910, p. 42. See also Water-Supply Paper U. S. Geol. Survey No. 225.

Alamos Creek; San Luis Obispo County; rises in the northern part of T. 31 S., R. 17 E., Mount Diablo base and meridian, in the San Luis Obispo National Forest; flows southwestward into Cuyama River (Santa Maria River, which discharges to the Pacific Ocean); length, about 18 miles. Land Office map of California, 1907.

Alascadero Creek; Santa Barbara County, rises in the Pueblo Lands of Santa Barbara, west of Irma; flows south of west 4 miles to the tidal marsh through which it enters the Pacific Ocean, just west of Goleta Landing; principal tributary, Maria Ygnacio Creek. Goleta special sheet.

Albion River; Mendocino County; rises in the west-central part of T. 16 N., R. 15 W., Mount Diablo base and meridian; flows irregularly westward 8 miles,

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then takes a southwesterly course to Albion, where it enters the Pacific; length, including major windings, 14 miles; receives a number of short tributaries, none of which are named on the map. Punnett's map of Mendocino County.

Alder Creek; Los Angeles River basin; Los Angeles County; formed in the west-central part of T. 3 N., R. 11 W., San Bernardino base and meridian, at altitude 5,500 feet above sea level, by the union of its North and Middle forks. The North Fork, which drains the larger area and must therefore be considered the continuation of the main stream, rises in the northwestern part of the same township and flows in general southward to its junction with the Middle Fork; below the forks the creek flows southward about 1 mile, then southwestward 2 miles into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); length, about 6 miles; fall, 2,050 feet; below the forks the principal tributary is the East Fork; headwaters intermittent. Tujunga sheet.

Alder Creek; Mendocino County; rises in the eastern part of T. 13 N., R. 15 W., Mount Diablo base and meridian; and flows southwestward 1 mile, then in general northwestward 13 miles; enters the Pacific 4 miles northeast of Point Arena. Punnett's map of Mendocino County.

Alder Creek; Russian River basin; Mendocino County; rises on the west slope of the Coast Range in the western part of T. 16 N., R. 10 W., Mount Diablo base and meridian; flows northwestward 6 miles to its junction with East Fork of Russian River (tributary through Russian River to the Pacific). Punnett's map of Mendocino County.

Alder Creek; Santa Ana River basin; San Bernardino County; rises in the northern part of T. 1 N., R. 2 W., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows southward 1½ miles, then southeastward 3 miles into Hemlock Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 3,850 feet. Redlands sheet.

Alder Creek; Santa Clara River basin; Ventura County; rises in the northeastern part of T. 6 N., R. 20 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows southeastward 4 miles, then southwestward 2½ miles into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific Ocean); fall, 3,900 feet; principal tributary, East Fork. Mount Pinos sheet.

Alder Creek; Truckee River basin; Nevada County; rises in the northern part of T. 17 N., R. 16 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows south of east 1½ miles, then northeastward 3½ miles into Prosser Creek (tributary to Truckee River, which discharges to Pyramid and Winnemucca lakes); fall, 840 feet, of which 500 feet is made in 1 mile at the head. Truckee sheet.

Alder Creek, East Fork; Los Angeles River basin; Los Angeles County; rises in southeastern part of T. 3 N., R. 11 W., San Bernardino base and meridian, at altitude 5,400 feet above sea level; flows in general northwestward to its junction with Alder Creek (tributary to Tujunga Creek and thus to Los Angeles River, which discharges to the Pacific Ocean); fall, 1,650 feet. Tujunga sheet.

Alder Creek, East Fork; Santa Clara River basin; Ventura County; rises in the south-central part of T. 6 N., R. 19 W., San Bernardino base and meridian, at altitude 4,300 feet above sea level; flows southwesterly into Alder Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific Ocean); length, about 3 miles; fall, 1,600 feet. Tejon sheet.

Alder Creek, Middle Fork; Los Angeles River basin; Los Angeles County, rises in the northeastern part of T. 3 N., R. 11 W., San Bernardino base and meridian, at altitude 5,500 feet above sea level; flows in general southwestward to its junction with the North Fork, with which it forms Alder Creek (tributary

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through Tujunga Creek to Los Angeles River, which discharges to the Pacific Ocean); length, about 3 miles; fall, 1,700 feet. Tujunga sheet.

Alger Lake; Mono County, Mono National Forest; 1 mile east of Blacktop Mountain; 1 inlet; no outlet shown on map; nearby drainage passes to Rush Creek in the Mono Lake basin; altitude, 10,500 feet. Mount Lyell sheet.

Alisal Creek; Salinas River basin; Monterey County; an intermittent southward-flowing stream, discharging into Salinas Valley 1½ miles northeast of Heins Lake. Salinas Valley map, sheet 1.

Alisal Creek; Santa Ynez River basin; Santa Barbara County; an intermittent stream, 6 miles long, rising on the northern slope of the Santa Ynez Mountains in the Santa Barbara National Forest and flowing west of north into Santa Ynez River (which discharges to the Pacific Ocean) I mile southwest of Santa Ynez Mission. Lompoc sheet.

Aliso Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream rising in the central part of T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing southward to San Fernando Valley. Santa Susana sheet.

Aliso Canyon Creek; San Diego County; rises in the southern part of Santa Margarita y las Flores Rancho, at altitude 500 feet above sea level; flows southwestward 10 miles and enters the Pacific 2 miles south of Las Flores station. San Luis Rey sheet.

Aliso Canyon Creek; Santa Clara River basin; Los Angeles County; rises in the San Gabriel Timber Land Reserve, 2½ miles north of Gleason Mountain, at altitude 4,400 feet above sea level; flows in general somewhat west of north to its junction with Santa Clara River (which discharges to the Pacific) in the Santa Barbara Forest Reserve; length, about 7 miles; fall, 1,550 feet; intermittent. Tujunga sheet.

Aliso Canyon Creek; Santa Clara River basin; Ventura County; rises on the south slope of Sulphur Mountain at altitude 2,500 feet above sea level; flows east of south to the valley of Santa Clara River (which discharges to the Pacific Ocean) in Santa Paula y Saticoy Rancho; length, about 7 miles; fall above the edge of the valley, 2,250 feet. Santa Paula sheet.

Aliso Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream rising in the Santa Barbara National Forest southeast of McPherson Peak and flowing northward to Cuyama River (Santa Maria River, which discharges to the Pacific Ocean); length, about 8 miles. Santa Ynez sheet.

Aliso Canyon Creek. *See also* Devil Creek.

Aliso Creek; Orange County; an intermittent stream, about 16 miles long, flowing southwesterly and entering the Pacific at Aliso Point; fall, about 1,000 feet. Corona sheet.

Alisol Slough; Salinas River basin; Monterey County; one of the channels through which Salinas River reaches Monterey Bay; this channel leaves the main channel about 2 miles south of Heins Lake and winds northwestward through the city of Salinas. Salinas Valley map, sheet 1.

Alkali Lake; Mono County, Cal., Douglas County, Nev.; inlets, several small intermittent streams; no outlet; about 2 miles long; 1 mile in maximum width; three-fourths of the lake is in Nevada; altitude, somewhat under 5,000 feet. Markleeville sheet.

Alkali Lakes; Modoc County; Surprise Valley; no outlets; three lakes of which the lower two (Lower and Middle lakes) are connected; the lakes receive the drainage from the eastern slope of Warner Mountains: they are typical playa lakes and during extreme dry seasons they become completely desiccated, leaving either fields of salt or playas of cream-colored mud. "The upper lake

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became dry in the summers of 1872 and 1873, leaving a broad mud-plain that was soon whitened with the saline effervescence. From the above date to the present time [1882] it has always contained some water. The lower lake was last completely desiccated about 10 years since [1874] when it deposited a large quantity of tolerably pure salt."[1]

The lakes are shallow but are shown on the Alturas sheet as permanent bodies of water; altitude, about 4,700 feet above sea level.

Alpine Creek; San Mateo County; rises in the west-central part of T. 7 S., R. 3 W., Mount Diablo base and meridian, at altitude 2,000 feet above sea level; flows south of west to its junction with Mindego Creek to form San Gregorio Creek, which discharges to the Pacific; length, about 3 miles; fall, 1,500 feet. Santa Cruz sheet.

Alum Rock Canyon Creek. *See* Penitencia Creek.

Alviso Creek; Mendocino County; rises in the southeastern part of T. 22 N., R. 17 W., Mount Diablo base and meridian; flows in general south of west about 5 miles, enters the Pacific 1 mile south of Hardy. Punnett's map of Mendocino County.

Alviso Slough; Santa Clara County; in the tidal marsh at the south end of San Francisco Bay; extends northwestward from Alviso to the mouth of Coyote River. San Jose and Palo Alto sheets.

Amargosa Creek; Los Angeles County; an intermittent stream heading somewhat below the snow line in the San Gabriel Mountains, flowing northeastward and entering Antelope Valley about 3 miles west of Palmdale. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, Pl. VI.

Amargosa River; Nevada-California; rises in Nye County, Nev., in springs in the mountains northeast of Bullfrog; flows southward intermittently across the desert through Franklin Lake to Resting Springs Dry Lake. On leaving the lake it enters a canyon about 10 miles long between Black and Kingston mountains, from which it emerges into the south end of Death Valley and turns westward to Saratoga Springs, whence it flows northwestward to the sink of Death Valley. The north end of Death Valley lies nearly due west of the head of the river, so that the depression as a whole has the form of a long, narrow U.

The Amargosa is about 140 miles long; it repeatedly appears, disappears, and reappears, flowing a short distance and then sinking, its water being absorbed by the sands until its channel crosses a ledge of bedrock, where it again emerges to view. Ordinarily water is seen at only a few places along the channel, but when a cloud-burst occurs in its drainage area it may become for a few hours a raging torrent. At Resting Springs Dry Lake the stream at such times has been over a mile wide and several feet deep, but since 1850 the river has not been known to carry enough water to flow on the surface as far as the lowest depression of Death Valley, and in its heaviest floods it rarely extends more than 4 or 5 miles below Saratoga Springs.

The water of the Amargosa is potable near its source, where it first rises in the springs, but as it percolates slowly downward through the sands it takes up increasing quantities of alkaline salts from the soil, so that when it comes to the surface along its lower course its waters are briny; where it widens out into the large playa at Resting Springs Dry Lake it leaves fields of salt as well as of borax and niter. The desert for many miles on either side of the river is dotted with spots and patches of salt. Hot springs discharge into it at a number of places.

[1] Russell, I. C., A geological reconnaissance in southern Oregon: Fourth Ann. Rept. U. S. Geol. Survey, 1884, p. 457.

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Authority.—Water-Supply Paper U. S. Geol. Survey No. 224, 1909, pp. 9, 14, Pl. I.

American Canyon Creek; Solano County; rises in the southern part of T. 4 N., R. 3 W., Mount Diablo base and meridian, at altitude 400 feet above sea level; flows northeastward 3 miles, then eastward 2 miles into Cordelia Slough, in the marsh on the north side of Suisun Bay. Napa sheet.

Anaheim Creek; Orange County; an intermittent stream which enters the ocean in a tidal marsh at Anaheim Landing, at Los Alamitos. Downey and Las Bolsas sheets.

Anderson Creek; Mendocino County; rises in the northern part of T. 13 N., R. 13 W., Mount Diablo base and meridian; takes a general northwesterly course to the western part of T. 14 N., R. 14 W., where it unites with Rancheria and Indian creeks to form Navarro River (tributary to the Pacific); length, 10 miles; principal tributaries, South Fork and Soda Creek. Punnett's map of Mendocino County.

Anderson Creek, South Fork; Mendocino County; rises in the southeastern part of T. 13 N., R. 13 W., Mount Diablo base and meridian; flows northwestward into Anderson Creek (tributary to Navarro River and thus to the Pacific); length, 5 miles. Punnett's map of Mendocino County.

Andreas Canyon Creek; Riverside County; rises in the northeastern part of T. 5 S., R. 3 E., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows southeastward 3 miles, then northeastward 2½ miles to the valley of Palm Canyon Creek (tributary to Whitewater River) where its waters sink. San Jacinto sheet.

Angela Lake; Nevada County; western part of T. 17 N., R. 15 E., Mount Diablo base and meridian; outlet, a stream about 2 miles long flowing very irregularly eastward into Donner Lake (outlet Donner Creek to Truckee River, which discharges to Pyramid and Winnemucca lakes); altitude, 7,150 feet; fall of outlet, about 1,200 feet. Truckee sheet.

Angelo Creek; a channel in the tidal marsh at the south end of San Francisco Bay. San Mateo sheet.

Anna River; Klamath County, Oreg.; heads south of Crater Lake in a large spring supposed to be fed by the waters of the lake; flows in general southeastward and discharges into Upper Klamath Lake (outlet to Klamath River, which discharges to the Pacific); called Wood River on the Klamath sheet and Anna Creek on the Ashland sheet, but described as Anna River in Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 178.

Annie Lake; Modoc County; northeastern part; 3 miles southeast of Bidwell Peak; no outlet; altitude, about 5,000 feet. Alturas sheet.

Antelope Creek; San Bernardino County; rises in the northwestern part of T. 1 N., R. 3 E., San Bernardino base and meridian, at altitude 8,200 feet above sea level; takes a general easterly and southeasterly course to the Colorado Desert; intermittent. San Gorgonio sheet.

Año Nuevo Creek; Santa Cruz and San Mateo counties; a stream about 4 miles long, rising in The Chalks and flowing southwestward into the Pacific in Año Nuevo Bay. Santa Cruz sheet.

Apache Canyon Creek; Santa Maria River basin; Ventura County; rises in the Santa Barbara National Forest, in the northeastern part of T. 8 N., R. 22 W., San Bernardino base and meridian, on the west slope of Sawmill Mountain, at altitude 7,500 feet above sea level; flows westward and southwestward 14 miles to its junction with Cuyama River (Santa Maria River, which discharges to the Pacific); intermittent. Mount Pinos sheet.

Apperson Creek; Alameda County; rises in the southwestern part of T. 4 S., R. 2 E., Mount Diablo base and meridian, on the northern slope of Valpe

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Ridge, at altitude 1,900 feet above sea level; flows northwestward 3 miles into San Antonio Creek (tributary to Alameda Creek, which discharges to San Francisco Bay); fall, 1,550 feet; tributary, South Fork. Pleasanton sheet.

Apperson Creek, South Fork; Alameda County; rises in the southeastern part of T. 4. S., R. 1 E., Mount Diablo base and meridian, on the western slope of Valpe Ridge, at altitude 1,750 feet above sea level; flows westward and northwestward to its junction with Apperson Creek (tributary to Alameda Creek, which discharges to San Francisco Bay); length, 2½ miles; fall, 1,250 feet. Pleasanton sheet.

Applegate Creek; Siskiyou County; rises in the central part of T. 47 N., R. 12 W., Mount Diablo base and meridian; flows northward 4 miles, then in general northeastward 6 miles to the western part of T. 48 N., R. 11 W., where it crosses the Oregon-California boundary line; it discharges into Rogue River (tributary to Illinois River, which flows to the Pacific) in the east-central part of Josephine County; principal tributary in Californa, Elliott Creek; other tributaries lie wholly in Oregon. Punnett's map of Siskiyou County; Land Office map of Oregon.

Archibald Creek; Scott Creek basin; Santa Cruz County; a stream, about 1½ miles long, rising in the western part of San Vicente Rancho and flowing southwestward toward Scott Creek, which discharges to the Pacific. Santa Cruz sheet.

Arctic Canyon Creek; San Bernardino County; T. 3 N., R. 1 E.; an intermittent stream, 3 miles long, flowing north of east into Mohave Desert, 1 mile south of Box S Springs. San Gorgonio sheet.

Arkansas Canyon; Salton Sink basin; San Diego County; central part of T. 12 S., R. 4 E., San Bernardino base and meridian; a drainage way about 2 miles long, carrying an intermittent stream to San, Felipe Valley. Ramona sheet.

Arrastre Canyon Creek; San Bernardino County; rises in the northeastern part of T. 3 N., R. 2 W., San Bernardino base and meridian, at altitude 5,950 feet above sea level; flows northwestward 6 miles to the edge of Mohave Desert, where its waters sink; intermittent. Deep Creek sheet.

Arrastre Canyon Creek; Santa Clara River basin; Los Angeles County; rises in the San Gabriel Timber land reserve, 1½ miles northeast of Gleason Mountain, at altitude 4,250 feet above sea level; flows northwestward into Santa Clara River (tributary to the Pacific) in the northeastern part of T. 4 N., R. 13 W.; length, about 4½ miles; fall above the mouth of the canyon, 1,500 feet; intermittent. Tujunga sheet.

Arrastre Creek; San Bernardino County; rises in the northeastern part of T. 1 N., R. 2 E., San Bernardino base and meridian, just north of Cienaga Seca, at altitude 8,000 feet above sea level; flows somewhat west of north to the Mohave Desert; its flood waters are carried out upon the desert near Old Woman Springs; fall in the 12 miles above the mouth of the canyon, 3,700 feet. San Gorgonio sheet.

Arroyo Aguague; Coyote River basin; Santa Clara County; rises in the eastern part of Canada de Palo Rancho, at altitude 2,400 feet above sea level; flows northwestward to its junction with Penitencia Creek (tributary to Coyote River, which discharges to San Francisco Bay) in Alum Rock Canyon; length, about 8 miles; fall, about 1,750 feet. Mount Hamilton sheet.

Arroyo Bayo; Alameda Creek basin; Santa Clara County; rises in the eastern part of T. 7 S., R. 4 E., opposite the head of Isabel Creek, at altitude about 2,300 feet above sea level; flows northwestward and northward about 7 miles to the southwestern part of T. 6 S., R. 4 E., where it joins San Antonio Creek to form Arroyo del Valle (tributary through Arroyo de la Laguna to

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Alameda Creek, which discharges to San Francisco Bay); length, about 7 miles; fall, 500 feet. Mount Hamilton sheet; on the Land Office Map of California, 1907, the name Bayo Creek is applied to a stream which on the Survey sheet is called Arroyo del Valle; Colorado Creek is called Bayo Creek, North Fork, on the Land Office map.

Arroyo Burro; Alascadero Creek basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 3,500 feet above sea level; flows southwestward 3 miles into San Antonio Creek, through which it is tributary to Maria Ygnacio Creek (tributary to Alascadero Creek, which discharges to the Pacific); fall, 2,900 feet. Santa Barbara and Goleta special sheets.

Arroyo Burro; Santa Ynez River basin; Santa Barbara County; an intermittent stream, 2 miles long, rising on the north slope of the Santa Ynez Mountains, in T. 5 N., R. 28 W., San Bernardino base and mridian, and flowing northwestward into Santa Ynez River, which discharges to the Pacific. Santa Ynez sheet.

Arroyo Calabasas; Los Angeles River basin; Los Angeles County; an intermittent stream, about 6 miles long, rising on the north slope of Santa Monica Mountains and flowing northeastward into San Fernando Valley. Calabasas sheet.

Arroyo de las Ortegas; Santa Barbara County; an intermittent stream rising on the south slope of the Santa Ynez Mountains, in the Santa Barbara National Forest, and flowing southwestward to the point at which it enters the Pacific Ocean near Miramar; upper stretch called Romero Canyon; tributary, Ficay Creek. Santa Barbara special sheet.

Arroyo del Hambre; rises in the northern part of Boca de la Canada de Pinole Rancho, at altitude 700 feet above sea level; flows in general eastward through Vaca Canyon, then northward to Martinez, where it enters Suisun Bay; principal tributary, Franklin Creek. Concord and Carquinez sheets.

Arroyo de los Alamos; San Antonio Creek basin; Santa Barbara County. *See* San Antonio Creek.

Arroyo de los Coches; Coyote River basin; Santa Clara County; rises in T. 6 S., R. 1 E., Mount Diablo base and meridian, on the northwest slope of Los Buellis Hills, at altitude 1,700 feet above sea level; flows westerly to Milpitas, then northwestward to its junction with Penitencia Creek (tributary to Coyote River, which discharges to San Francisco Bay); length, about 5 miles. San Jose sheet.

Arroyo Cavelano. *See* Cayetano Creek.

Arroyo de la Laguna; Alameda Creek basin; Contra Costa and Alameda counties; rises in Contra Costa County, in the northeastern part of T. 1 S., R. 1 W., Mount Diablo base and meridian, at altitude 650 feet above sea level; flows east of south through Amador Valley, along the eastern base of Pleasanton Ridge, and joins Alameda Creek (tributary to San Francisco Bay) at the northern end of Sunol Valley; length, about 15 miles; principal tributaries, Alamo, Tassajero, Arroyo las Positas, and Arroyo del Valle, intermittent streams which drain Las Positas and Livermore valleys. The stream in Arroyo de la Laguna is intermittent above Livermore Valley. Mount Diablo and Pleasanton sheets.

Arroyo de la Laguna; Coyote River basin; Alameda County; rises in the marsh south of The Lagoon, in Ex Mission San Jose Rancho; flows southward about 3 miles; sinks before reaching the tidal marsh through which Coyote River enters San Francisco Bay. Pleasanton sheet.

Arroyo de los Frijoles; San Mateo County; an intermittent stream, about 4 miles long, rising in the northeastern part of Punto del Año Nuevo Rancho,

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and flowing northwestward into the Pacific through a small bay 1½ miles southeast of Pescadero Point; forms the south boundary of Butano Rancho. Santa Cruz sheet.

Arroyo del Toro; San Jacinto River basin; Riverside County; western part of T. 5 S., R. 4 W., San Bernardino base and meridian; a drainage channel extending southward toward North Elsinore, 2 miles north of Elsinore Lake. Elsinore sheet.

Arroyo del Valle; Alameda Creek basin; Santa Clara and Alameda counties; formed in the southwestern part of T. 6 S., R. 4 E., Mount Diablo base and meridian, by the junction of San Antonio Creek and Arroyo Bayo (q. v.); flows northwestward to the southern edge of Livermore Valley, then westward to Arroyo de la Laguna (tributary to Alameda Creek, which discharges to San Francisco Bay) 2 miles west of Pleasanton; length, including major windings, 32 miles; principal tributary below the mouth of San Antonio Creek, Colorado Creek; intermittent below the canyon. Mount Hamilton, Tesla, and Pleasanton sheets.

Arroyo de San Augustin; Santa Barbara County; an intermittent stream, about 2 miles long, flowing southward into the Pacific near San Augustin station. Lompoc sheet.

Arroyo el Bulito; Santa Barbara County; an intermittent stream. 3 miles long, flowing southward toward the Pacific 1 mile east of San Augustin. Lompoc sheet.

Arroyo Grande Creek; San Luis Obispo County; rises on the west slope of the Santa Lucia Range; flows southwestward to the point at which it enters the Pacific, west of Oceano. Arroyo Grande sheet.

Arroyo Hondo; Alameda Creek basin; Santa Clara County; formed in the southwestern part of T. 6 S., R. 3 E., Mount Diablo base and meridian, at altitude 1,700 feet above sea level, by the junction of Isabel and Smith creeks (q. v.); flows northwestward to the north end of Calaveras Valley, where it joins Calaveras Creek (tributary through Alameda Creek to San Francisco Bay); length, about 11 miles; fall, 1,075 feet. Mount Hamilton and San Jose sheets.

Arroyo Hondo; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains; flows southward 3 miles to the point at which it enters the Pacific, 4 miles east of Alcatraz. Lompoc sheet.

Arroyo las Positas; Alameda Creek basin; Alameda County; rises in the northern part of T. 3 S., R. 3 E., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows westerly through Las Positas and Livermore valleys to the south end of Amador Valley, where it joins Arroyo de la Laguna (tributary to Alameda Creek, which discharges to San Francisco Bay); length, about 16 miles; principal tributaries, Arroyo Seco, Cayetano, Collier Canyon, Cottonwood, and Arroyo Mocho creeks; intermittent throughout its course. Tesla and Pleasanton sheets.

Arroyo Mocho; Alameda Creek basin; Santa Clara and Alameda counties; rises in the northeastern part of T. 7 S., R. 4 E., Mount Diablo base and meridian, at altitude about 3,250 feet above sea level; flows northward and northwestward to the west end of Livermore Valley, where it joins Arroyo las Positas (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay); length, about 30 miles; fall, 2,900 feet. Mount Hamilton, Tesla, and Pleasanton sheets.

Arroyo Parida; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains in the Santa Barbara National Forest, at altitude 3,350 feet above sea level; flows in general west of south to the point at which it

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enters the Pacific near Carpinteria Landing; length, about 5 miles; tributary, Oil Canyon Creek; intermittent. Santa Barbara special sheet.

Arroyo Quemado; Santa Barbara County; an intermittent stream, rising in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 1,500 feet above sea level, and flowing southward into the Pacific Ocean 1 mile northwest of Tajiguas. Lompoc sheet.

Arroyo San Antonio; Sonoma and Marin counties; rises in the northern part of Rancho Laguna de San Antonio; flows southwestward 2 miles, southward 2½ miles, then westward to Tomales Bay, through which it enters the Pacific; length, about 13 miles. Punnett's map of Sonoma and Marin counties.

Arroyo San Mateo. *See* San Mateo Creek.

Arroyo San Onofre; San Diego County; rises on the western slope of Santa Margarita Mountains, at altitude 2,500 feet; flows southwestward and enters the Pacific at San Onofre; length, about 15 miles; of the total fall, 1,500 feet is made in less than 4 miles in the canyon. San Luis Rey and Capistrano sheets.

Arroyo Santa Rosa; Ventura County; an intermittent stream, 4½ miles long, tributary to Canejo Creek (and thus to Calleguas Creek, which discharges to the Pacific) in the northern part of El Canejo Rancho. Camulos sheet.

Arroyo Seco; Alameda Creek basin; Alameda County; rises in the east-central part of T. 3 S., R. 3 E., Mount Diablo base and meridian, at altitude about 2,000 feet above sea level; flows in general northwestward to Livermore Valley, where it joins Arroyo las Positas (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay); length, about 10 miles; fall, 1,450 feet. Tesla sheet.

Arroyo Seco; Los Angeles River basin; Los Angeles County; rises on the southeast slope of Strawberry Peak, 2 miles north of the head of the West Fork of the San Gabriel, at altitude 5,000 feet above sea level; takes a general southwesterly course of the city of Los Angeles, where it joins Los Angeles River. The stream has a mountain drainage area about 5 miles deep, extending in a direct line back to the top of the ridge from the canyon opening, and comprises 16 to 17 square miles of territory, made up of bare granite slopes, crumbling masses of rock, and glistening ridges practically destitute of vegetation. The river emerges from the mountains into the San Gabriel basin, as defined by the more commanding hills, but its waters pass through a gorge in those hills to the Los Angeles; it receives an insignificant amount of water from the western end of the Canada Pass north of the San Rafael Hills, and at times of flood, a small quantity of water from 6½ square miles on the eastern and southerly slopes of these hills, but there is no territory on its eastern side below the cañada which drains into it above ground. One and a half miles below the main canyon, the creek reaches the northeastern point of the San Rafael Hills and passes through a rocky gorge, 70 to 80 feet deep and at one point not over 30 feet wide at the bottom, known as the Devils Gate; above the Devils Gate the arroyo presents the appearance of a gravel-filled basin, 1½ miles long and half a mile wide, the eastern rim being a nearly perpendicular gravel bluff, 70 to 100 feet high, the western side a series of lower benches rising to the mesa in the cañada.

Except in times of flood the waters of the stream sink into the gravel in the mouth of the canyon or near the upper end of this basin into which it opens. Out of the gravels of the basin near its lower end, and within a few hundred feet of the Devils Gate, two groups of springs rise whose waters join in one channel at the gorge, flow on through it, and again sink into the gravels of a second basin immediately below. The second basin is bounded on the west by the San Rafael Hills and on the east by the mesa bluff; it is 2½ miles long and three-fourths mile wide. Through the lower end of this basin the arroyo cuts

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for several hundred feet through another bedrock point of the hills, and just at the entrance of this gorge, which is due west of the main part of the city of Pasadena, is another group of springs whose waters flow above ground through the narrow pass below and within several hundred yards are lost in the gravels of a third arroyo basin. About a mile below there is another uprising of waters, and finally at the entrance of the arroyo to the lower canyon, where it turns west through the hills toward the San Fernando basin, some rising waters are again encountered. Except in times of flood no water from Arroyo Seco reaches Los Angeles River above ground.

Principal tributaries are Little Bear Creek, Bear Canyon Creek, and Millard Canyon Creek.

Gaging station near Pasadena (1910–1912).

Authorities.—Tujunga and Pasadena sheets: Hall, Wm. Ham., Irrigation in southern California, Sacramento, 1888, pp. 385–389.

Arroyo Seco; Salinas River basin; Monterey County; rises in the eastern part of T. 19 S., R. 3 E., Mount Diablo base and meridian, in the Monterey National Forest; flows eastward about 15 miles, then northward 10 miles to its junction with Salinas River (tributary through Monterey Bay to the Pacific) near Soledad; principal tributaries, Fresno Canyon, Portero Canyon, and Release Canyon creeks. Gaging station near Soledad (1900–1912). Land Office map of California, 1907.

Arroyo Seco; Santa Margarita River basin; San Diego and Riverside counties; rises in San Diego County on the eastern slope of Agua Tibia Mountains, at altitude 3,100 feet above sea level; takes a circuitous but in general northerly course to its junction with Temecula Creek (Santa Margarita River, which discharges to the Pacific) at the upper end of Nigger Canyon; length, about 8 miles; fall, 1,800 feet. Ramona sheet.

Arroyo Seco; Sonoma County; rises in the southern part of T. 6 N., R. 5 W., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows southward into Steamboat Slough, one of the sloughs between Sonoma Creek and Napa River. Napa sheet.

Arroyo Sequit; Ventura and Los Angeles counties; formed in the eastern part of T. 1 S., R. 20 W., San Bernardino base and meridian, by the union of its East and West forks. The East Fork rises in Los Angeles County, 2 miles southeast of Triunfo Pass and flows in general southwestward. The West Fork rises in Triunfo Pass and flows east of south. Below the forks the course of the creek is west of south to the point at which it enters the Pacific; length below the forks, about 3 miles; total length to head of West Fork, 5 miles. Camulos sheet.

Arroyo Sequit, East and West forks. *See* Arroyo Sequit.

Arroyo Trabuco; Orange County; rises between Trabuco and Los Pinos peaks, at altitude 4,000 feet above sea level; flows in general southwesterly to its junction with San Juan Creek (tributary to the Pacific Ocean) at Capistrano; length, about 22 miles; fall, 3,900 feet, of which 2,500 feet is made in 5 miles in passing through Trabuco Canyon at the head. Elsinore and Corona sheets.

Arroyo Viejo; Alameda County; rises 2½ miles northeast of San Leandro and 1 mile north of Lake Chabot; flows westward to the tidal marsh through which it enters San Leandro Bay, a branch of San Francisco Bay. Concord sheet.

Ash Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 47 N., R. 7 W., Mount Diablo base and meridian, on the south slope of Ash Peak; flows southward 3 miles into Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

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Ash Creek; Owens Lake basin; Inyo County; rises on the east slope of the Sierra in the northeastern part of T. 18 S., R. 35 E., Mount Diablo base and meridian, at altitude 10,050 feet above sea level; flows eastward about 8½ miles to the point at which it enters Owens Lake; fall, about 6,500 feet; intermittent in lower course; principal tributary, South Fork. Gaging station near Lone Pine (1906–1909). Olancha sheet.

Ash Creek, South Fork; Inyo County; rises on the east slope of the Sierra at altitude 9,500 feet above sea level; flows northeastward 4 miles to its junction with Ash Creek (tributary to Owens Lake); fall, 4,600 feet. Olancha sheet.

Aspen Lake; Klamath County; Oreg.; several inflowing streams; outlet, a stream, 6 miles long, flowing northward into Pelican Bay, Upper Klamath Lake (outlet, Klamath River, which discharges to the Pacific); altitude, about 4,500 feet above sea level. Klamath and Ashland sheets.

Asphaltum Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 2 miles long, flowing southwestward from Asphaltum Mine in Sisquoc Rancho toward the head of Foxen Canyon Creek (tributary through Sisquoc River to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Aurora Canyon Creek; Walker River basin; Mono County; rises in the northern part of T. 4 N., R. 26 E., Mount Diablo base and meridian, at altitude 8,650 feet above sea level; flows northwestward 3½ miles, then southwestward 4½ miles to its junction with East Walker River (tributary to Walker River, which discharges to Walker Lake) at Bridgeport; fall, 2,200 feet; intermittent. Bridgeport sheet.

Austin Creek; Sonoma County; rises in the eastern part of T. 9 N., R. 12 W., Mount Diablo base and meridian; takes a general southeasterly course to the northeastern part of T. 7 N., R. 11 W., where it enters Russian River (tributary to the Pacific); length, 12 miles; principal tributaries, Wards Creek, East Fork, and Kidd Creek. Punnett's map of Sonoma County.

Austin Creek, East Fork; Sonoma County; rises in the northern part of T. 8 N., R. 11 W., Mount Diablo base and meridian; flows southward 4½ miles to its junction with Austin Creek (tributary to Russian River and thus to the Pacific) near Watson. It seems possible that the name, East Fork of Austin, has been carried up the wrong branch of this stream, as it receives within 2 miles of its head, an unnamed stream rising in the northwestern part of T. 9 N., R. 11 W. and flowing in general southeastward to the junction with the East Fork as named. This stream is about 9 miles long and receives from the east an unnamed tributary 5 miles long. Punnett's map of Sonoma County.

Avawatz Dry Lake; San Bernardino County; in T. 16 N., R. 4 E., San Bernardino base and meridian, south of Avawatz Mountains and north of Granite Mountains. Water-Supply Paper U. S. Geol. Survey No. 224, Pl. I.

Ayers Creek; Ventura River basin; Ventura County; an intermittent stream, 2 miles long, flowing eastward into Coyote Creek (tributary to Ventura River, which discharges to the Pacific Ocean) one-fourth mile south of mouth of Santa Ana Creek. Ventura sheet.

Bailey Canyon Creek; Los Angeles County; northwestern part of T. 1 N., R. 11 W., San Bernardino base and meridian; an intermittent stream, about 1 mile long, flowing southward to the edge of San Gabriel Valley (drained by San Gabriel River, which discharges to the Pacific). Pasadena sheet.

Bairs Creek; Inyo County; rises 1½ miles south of east from Mount Williamson, at altitude 11,500 feet above sea level; flows northeastward 8 miles to the edge of Owens Valley (Owens Lake basin) where its waters sink; fall, 7,500

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feet, of which 5,500 feet is made in the first 4 miles. Gaging station near Thebe (1906–1909). Mount Whitney sheet.

Baisley Creek; Riverside County; rises in the northern part of T. 6 S., R. 2 E., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southwestward 2½ miles to Bautiste Creek (tributary to San Jacinto River); intermittent; fall, 1,700 feet. San Jacinto sheet.

Baker Canyon Creek; Orange County; rises on the west slope of Santa Ana Mountains, at altitude 1,800 feet above sea level; flows southwestward 3 miles, then northwestward 1 mile into Santiago Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, about 900 feet; intermittent. Corona sheet.

Baker Creek; Inyo County; rises on the east slope of the Sierra in the western part of T. 9 S., R. 32 E., Mount Diablo base and meridian, at altitude 12,000 feet above sea level; flows northeastward 4½ miles, southeastward 5 miles, then northeastward 5 miles into Owens Valley (Owens Lake basin) north of Big Pine; fall, about 8,000 feet. Gaging station near Big Pine (1907–1910). Bishop and Mount Goddard sheets.

Baldwin Creek; Santa Cruz County; a stream about 3 miles long, rising in the northern part of Refugio Rancho and flowing southwestward into the Pacific 1 mile northwest of Needle Rock Point. Santa Cruz sheet.

Baldwin Lake; San Bernardino County; T. 2 N., Rs. 1 and 2 E., at the eastern end of Bear Valley; a temporary water body occupying a completely closed depression, at an altitude of 6 674 feet. San Gorgonio sheet.

Ballard Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising on the north slope of Santa Ynez Mountains, in Lomas de la Purificacion Rancho, and flowing northwestward to Santa Ynez River (tributary to the Pacific) 2 miles southeast of Santa Ynez Mission. Lompoc sheet.

Ballinger Canyon Creek; Ventura and Santa Barbara counties; rises in the north-central part of T. 9 N., R. 23 W., San Bernardino base and meridian, in the Santa Barbara National Forest, at altitude 5,000 feet above sea level; flows north of west into Cuyama River (Santa Maria River, which discharges to the Pacific); length, 8 miles, in which distance the fall is 2,400 feet; intermittent. Mount Pinos sheet.

Ballona Creek; Los Angeles County; rises in springs issuing on La Brea and Rodeo de las Aguas ranchos; flows southward to the base of the Centinela Hills where it turns to the south and southwest and discharges into Ballona Lagoon. Santa Monica and Redondo sheets; Hall, Wm. Ham., Report of the State Engineer of California on irrigation and the irrigation question, pt. 2, Sacramento, 1888, p. 572.

Ballona Lagoon; Los Angeles County; La Ballona Rancho; receives the drainage of Ballona and Centinela creeks. The lagoon lies behind the sandbar, which is cut through near Port Ballona. Redondo sheet.

Banner Canyon Creek; San Diego County; rises in the northern part of T. 13 S., R. 4 E., San Bernardino base and meridian; flows northwestward 2 miles, then making an abrupt turn flows southeastward 3 miles, then to the northeast 2 miles into San Felipe Valley, which drains southeastward toward Salton Sink. Ramona sheet.

Bare's Creek; Lassen County; northeastern part; rises on the north slope of Hat Peak in a small lake, at altitude 5,800 feet above sea level; flows northeastward about 10 miles, and discharges into the south end of Lower Alkali Lake; principal tributary, a stream from Snake Lake. Alturas sheet.

Barkhouse Creek; Siskiyou County; rises in the northeastern part of T. 45 N., R. 9 W., Mount Diablo base and meridian; flows in general somewhat east of

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north to its junction with Klamath River (tributary to the Pacific) half a mile below the mouth of Little Humbug Creek. Punnett's map of Siskiyou County.

Barlow Canyon Creek; Ventura County; an intermittent stream draining a small area in the southwestern part of Ex Mission San Buenaventura and flowing south of west toward Santa Clara River, which discharges to the Pacific. Santa Paula sheet.

Barney Lake; Mono County; northern part of T. 3 N., R. 23 E., Mount Diablo base and meridian; inlet, Robinson Creek, which flows through this lake and Twin Lakes to its junction with East Walker River (tributary to Walker River, which discharges to Walker Lake); altitude, 8,250 feet; fall of Robinson Creek in the 3 miles above the upper Twin Lake, 1,150 feet; very small. Bridgeport sheet.

Bartlett Canyon Creek. *See* Cameros Valley Creek.

Barton Canyon Creek; San Diego and Riverside counties; an intermittent stream, 3 miles long, rising in the northeastern part of T. 9 S., R. 7 E., San Bernardino base and meridian, and flowing northeastward toward the Colorado Desert. Indio special sheet.

Basquez Creek; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains in T. 31 S., R. 13 E., Mount Diablo base and meridian; flows southeastward to its junction with Arroyo Grande Creek, which discharges to the Pacific. Arroyo Grande sheet.

Batiquitos Lagoon; San Diego County; 3 miles north of Encinitas; a brackish-water marsh separated from the Pacific by a narrow sand ridge which may at times be cut through by the flood waters of San Marcos Creek. Escondido and Oceanside sheets.

Bautiste Creek; rises in the southwestern part of T. 6 S., R. 3 E., San Bernardino base and meridian, at altitude 5,300 feet above sea level; takes a general northwesterly course to San Jacinto Valley at the city of San Jacinto; fall in the 10 miles above the mouth of the canyon, 3,000 feet. San Jacinto sheet.

Baxter Creek; Lassen County; rises in the northwestern part of T. 28 N., R. 12 E., at altitude 4,400 feet above sea level; flows northeastward 2 miles, then southeastward 10 miles to the point at which it enters Honey Lake; fall, about 500 feet. Honey Lake sheet.

Bayo Creek, North Fork. *See* Colorado Creek.

Bean Creek; Santa Cruz County; rises in the northwestern part of T. 10 S., R. 1 W., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows southwestward to its junction with Zayante Creek (tributary to San Lorenzo River, which discharges to the Pacific) near Felton; fall, about 700 feet. Santa Cruz sheet.

Bear Canyon Creek; Los Angeles River basin; Los Angeles County; rises on the west slope of San Gabriel Peak, at altitude 5,500 feet above sea level; flows northwestward into Arroyo Seco (tributary to Los Angeles River, which discharges to the Pacific); fall, 2,700 feet. Pasadena sheet.

Bear Canyon Creek; Riverside County; an intermittent stream, about 2 miles long, flowing northward and entering San Juan Creek in southwestern part of T. 6 S., R. 5 W., San Bernardino base and meridian; fall, about 900 feet. Elsinore sheet.

Bear Canyon Creek; Santa Ana River basin; Los Angeles County; rises in northwestern part of T. 2 N., R. 7 W., San Bernardino base and meridian, at altitude 7,750 feet above sea level; flows southward into San Antonio Canyon Creek (tributary to Santa Ana River, which discharges to the Pacific). San Antonio and Cucamonga sheets.

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Bear Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, 4 miles long, rising at the eastern end of the Liebre Mountains in T. 7 N., R. 17 W., San Bernardino base and meridian, and flowing southwestward into Castac Creek (tributary to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Bear Canyon Creek; Santa Clara River basin; Los Angeles County; rises in the northwestern part of T. 3 N., R. 14 W., San Bernardino base and meridian, at altitude 2,750 feet above sea level; flows northwestward into Sand Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific), to which it delivers water only in times of flood; length, 2 miles; fall, 1,300 feet. Fernando sheet.

Bear Canyon Creek; Santa Clara River basin; Ventura County; rises in the southwestern part of T. 5 N., R. 21 W., San Bernardino base and meridian, in the Santa Barbara National Forest, at altitude 3,250 feet above sea level; flows southwestward to Sisar Creek (tributary to Santa Paula Creek and thus to Santa Clara River, which discharges to the Pacific); length, 2½ miles; fall, 1,700 feet; sinks before reaching the creek. Santa Paula sheet.

Bear Canyon Creek; Santa Clara River basin; Ventura County; rises in the west-central part of T. 5 N., R. 21 W., San Bernardino base and meridian, on the north slope of Topatopa Mountains, at altitude 6,000 feet above sea level; flows west of north into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, 3½ miles; fall, 3,200 feet. Mount Pinos sheet.

Bear Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 4½ miles long, rising in the southern part of T. 11 N., R. 31 W., and flowing southward to the North Fork of Labrea Creek (tributary through Sisquoc River to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Bear Canyon Creek; Santa Maria River basin; Ventura County; an intermittent stream, 3½ miles long, rising in the southeastern part of T. 7 N., R. 24 W., San Bernardino base and meridian, and flowing northeastward to Cuyama River (Santa Maria River). Mount Pinos sheet.

Bear Canyon Creek; Santa Ynez River basin; Santa Barbara County; an intermittent stream, 2 miles long, rising on the north slope of the Santa Ynez Mountains, and flowing northeastward into Santa Ynez River (which discharges to the Pacific) in Tequepis Rancho. Santa Ynez sheet.

Bear Creek; Eel River basin; Humboldt County; rises in the northeastern part of T. 1 S., R. 1 E., Humboldt base and meridian; flows in general northeastward to its junction with Eel River (tributary to the Pacific); length, about 5 miles. Punnett's map of Humboldt County

Bear Creek; Eel River basin; Lake County; rises in the southern part of T. 18 N., R. 8 W., Mount Diablo base and meridian, on the west slope of Snow Mountain; takes a general southwesterly course to its junction with Rice Fork of Eel River (tributary to Eel River, which flows to the Pacific); length, 8 miles. Punnett's map of Lake and Mendocino counties.

Bear Creek; Klamath River basin; Siskiyou County; rises on the north slope of Willow Creek Mountain, at altitude 6,000 feet above sea level; flows northeastward 6 miles into Shovel Creek (tributary to Klamath River, which flows to the Pacific). Shasta sheet. Called Shovel Creek on Punnett's map of Siskiyou County.

Bear Creek; Klamath River basin; Trinity County; rises in the northern part of T. 35 N., R. 10 W., Mount Diablo base and meridian; flows southwestward 2 miles into Canon Creek (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

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Bear Creek; Klamath River basin; Trinity County; rises in the eastern part of T. 40 N., R. 6 W., Mount Diablo base and meridian, on the west slope of Eddy Mountain, at altitude 6,000 feet above sea level; flows northwestward 1½ miles, then westward 1½ miles into Trinity River (tributary to Klamath River, which discharges to the Pacific); fall, 600 feet. Shasta sheet (on which it is not named); Punnett's map of Trinity County.

Bear Creek; Salinas River basin; Monterey County; rises in the southeastern part of T. 20 S., R. 5 E., Mount Diablo base and meridian, east of Pinon Peak, flows southeastward 6 miles into San Antonio River (tributary to the Salinas River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

Bear Creek; San Dieguito River basin; San Diego County; rises in the southern part of T. 11 S., R. 1 E., San Bernardino base and meridian, at altitude about 3,000 feet above sea level; flows west of south 2 miles, then southeastward 1½ miles into Temescal Creek (tributary to Santa Ysabel Creek—San Dieguito River, which discharges to the Pacific); intermittent; fall, about 2,000 feet. Ramona sheet.

Bear Creek; San Francisquito Creek basin; San Mateo County; rises half a mile northeast of Sierra Morena, at altitude 2,000 feet above sea level, flows very irregularly eastward to its junction with San Francisquito Creek (tributary to San Francisco Bay) just below Searsville Lake; tributary, West Union Creek. Santa Cruz and Palo Alto sheets.

Bear Creek; San Gabriel River basin; Los Angeles County; rises in the northwestern part of T. 3 N., R. 9 W., San Bernardino base and meridian, on the northwest slope of Mount Islip, at altitude 6,500 feet above sea level; flows west of south about 10 miles into the West Fork of San Gabriel River (tributary to San Gabriel River, which discharges to the Pacific); fall, 4,900 feet; principal tributary, West Fork. Rock Creek and Pomona sheets.

Bear Creek; San Lorenzo River basin; Santa Cruz County; rises in the southeastern part of T. 8 S., R. 2 W., Mount Diablo base and meridian, on the west slope of Castle Rock Ridge, at altitude 2,300 feet above sea level; flows southwestward to its junction with San Lorenzo River (tributary to the Pacific) near the town of Boulder Creek; length, about 8 miles; fall, about 1,800 feet; tributary, Deer Creek. Santa Cruz sheet.

Bear Creek; San Pablo Creek basin; Contra Costa County; rises in the eastern part of Boca de la Canada del Pinole Rancho, at altitude 1,200 feet above sea level; flows, in general, southwestward to its junction with San Pablo Creek, which discharges to San Pablo Bay; length, about 6½ miles; fall, 900 feet. Concord sheet.

Bear Creek; Santa Ana River basin; San Bernardino County; rises in Bear Lake, in the central part of T. 2 N., R. 1 W., San Bernardino base and meridian, at altitude 6,650 feet above sea level; flows west of south to its junction with Santa Ana River (tributary to the Pacific); length, about 7 miles; fall, 3,250 feet; principal tributaries, North Fork, Camp, Lake, and Johnson creeks. See Bear Lake. San Gorgonio and Redlands sheets.

Bear Creek; Santa Barbara County; an intermittent stream, about 1 mile long, draining a small area in the western part of Lompoc Rancho and flowing northwestward to a completely closed depression just east of the coast line. Guadalupe sheet.

Bear Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2 miles long, rising in the southwestern part of T. 5 N., R. 19 W., San Bernardino base and meridian, and flowing northwestward into Tar Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

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Bear Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 2½ miles long, rising 3 miles southwest of Cuyama Peak, and flowing east of south into Rancho Nuevo Creek, which is tributary to Cuyama River (Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Bear Creek; Truckee River basin; Placer County; rises in the northwestern part of T. 15 N., R. 16 E., Mount Diablo base and meridian, on the north slope of Ward Peak, at altitude 8,000 feet above sea level; flows northeastward into Truckee River (tributary to Pyramid and Winnemucca lakes); length, about 5 miles; fall, 1,900 feet. Truckee sheet.

Bear Creek, Big; Klamath River basin; Trinity County; rises in the central part of T. 33 N., R. 12 W., Mount Diablo base and meridian; flows northward into Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 4 miles. Punnett's map of Trinity County.

Bear Creek, Little; Los Angeles River basin; Los Angeles County; rises 1½ miles northwest of San Gabriel Peak, at altitude 4,650 feet above sea level; flows north of west 1½ miles into Arroyo Seco; fall, 1,700 feet. Tujunga sheet.

Bear Creek, Little; Mohave River basin; San Bernardino County; rises in the southwestern part of T. 2 N., R. 3 W., 1 mile east of Strawberry Peak, at altitude 5,500 feet above sea level; flows northeastward about 6 miles to its junction with Deep Creek (tributary to Mohave River); fall, 800 feet; principal tributaries, Burnt Mill, Fleming, and Hooks creeks. Redlands and Deep Creek sheets.

Bear Creek, North Fork; Santa Ana River basin; San Bernardino County; rises in the western part of T. 2 N., R. 1 W., on the southern slope of Crafts Peak, at altitude 8,000 feet above sea level; flows southeastward 2 miles to its junction with Bear Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 2,750 feet. Redlands sheet.

Bear Creek, West Fork; San Gabriel River basin; Los Angeles County; rises in the southwestern part of T. 3 N., R. 10 W., San Bernardino base and meridian, 1 mile west of Waterman Mountain, at altitude 6,750 feet above sea level; flows southeastward about 5 miles to its junction with Bear Creek (tributary through West Fork San Gabriel River to San Gabriel River, which discharges to the Pacific); fall, 4,600 feet. Rock Creek sheet.

Bear Gulch Creek; Alameda Creek basin; Alameda and Santa Clara counties; rises in the western part of T. 5 S., R. 3 E., Mount Diablo base and meridian, on the south slope of Valpe Ridge, at altitude 3,350 feet above sea level; flows southwestward to Alameda Creek, which discharges to San Francisco Bay; length, 2 miles; fall, 1,950 feet. Mount Hamilton sheet.

Bear Lake; San Bernardino County; T. 2 N., Rs. 1 E. and 1 W., San Bernardino base and meridian. The valley of the Upper Santa Ana River extends in an east-west direction along the northern base of the San Bernardino and San Gorgonio mountains. To the north of the valley is a long rugged mountain ridge whose crests hold the general altitude of about 7,500 feet above sea level, and beyond this ridge, with its axis in the same direction and about 4½ miles from the main mountains on the south, is a remarkably flat mountain basin called Bear Valley. This valley has the appearance of once having held a lake whose waters, at an elevation of 125 feet from its bottom, overflowed at the east end into the head of a canyon which leads away to the Colorado Desert. Now, however, the valley contracts at its western end to a narrow rock-bound gorge which extends southward around the west end of the mountain ridge and joins the canyon of Santa Ana River about 10 miles above its outlet into San Bernardino Valley. This gorge holds Bear Creek, at whose point of departure from the valley a dam has been built, making or remaking the basin into a lake. The dam is remarkable chiefly because of its slender proportions,

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which have made it to the engineering fraternity the "eighth wonder of the world." The waters of the reservoir, when liberated, flow down Bear Creek to Santa Ana River.

The waters stored in Bear Lake are used in the settlements of Redlands, Crafton, and Highlands, which are among the choicest of the orange-growing regions of Southern California, and the irrigation districts of Alessandro and Perris are the outgrowth of this water storage, although Perris receives only a small portion of its supply from this source.

Authorities: San Gorgonio sheet; Hall, Wm. Ham., Irrigation in California [southern]: Report of the State Engineer of California on irrigation and the irrigation question, pt. 2, Sacramento, 1888, pp. 177–183. See also Reservoirs for irrigation, water powers, and domestic supply, by J. D. Schuyler, 2d ed., 1908, pp. 246–256.

Bear River; Humboldt County; rises in the southwestern part of T. 1 S., R. 1 E., Humboldt base and meridian; flows east of north 4 miles, then northwestward 18 miles to the central part of T. 1 N., R. 3 W., where it enters the Pacific. Punnett's map of Humboldt County.

Beard Creek; Alameda County; a channel in the tidal marsh in the southern end of San Francisco Bay, extending from the bay to Newark Creek. Haywards sheet.

Beartrap Canyon Creek; Los Angeles County; an intermittent stream, about 2 miles long, rising in the northern part of T. 6 N., R. 18 W., San Bernardino base and meridian, and flowing northeastward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Beartrap Creek; Ventura County; rises in the northwestern part of T. 6 N., R. 22 W., San Bernardino base and meridian, on the north slope of Pine Mountain, at altitude 7,000 feet above sea level; flows northwestward to Cuyama River (Santa Maria River, which discharges to the Pacific); length, about 7 miles; fall, 3,200 feet. Mount Pinos sheet.

Beaver Creek; Klamath River basin; Siskiyou County; rises in the central part of T. 48 N., R. 8 W., Mount Diablo base and meridian; flows southwestward 5 miles, then irregularly southward about 6 miles to its junction with Klamath River (tributary to the Pacific) in the northwestern part of T. 46 N., R. 8 W.; principal tributaries Grouse and Hungry creeks, and West Fork. Punnett's map of Siskiyou County.

Beaver Creek; Rhett Lake basin; Modoc County; rises on the northwest slope of Timbered Mountain; flows northwestward into South Fork of Willow Creek (tributary through Willow Creek to Lost River, which discharges to Rhett Lake); length, 3 miles. Alturas sheet.

Beaver Creek, West Fork; Klamath River basin; Siskiyou County; rises in the southwestern part of T. 48 N., R. 9 W., Mount Diablo base and meridian; flows in general somewhat south of east 7 miles to its junction with Beaver Creek (tributary through Klamath River to the Pacific). Punnett's map of Siskiyou County.

Bedford Canyon Creek; Riverside County; an intermittent stream, 6 miles long, rising on the north slope of Bedford Peak (altitude 3,720 feet) and flowing northeastward into Temescal Creek (tributary to Santa Ana River, which discharges to the Pacific). Corona sheet.

Bee Canyon; San Luis Obispo County; southern part of Corral de Piedro Rancho; opens southeastward to Corbett Canyon (tributary to Arroyo Grande Creek, which discharges to the Pacific). Arroyo Grande sheet.

Bee Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream rising in the central part of T. 3 N., R. 16 W., San Bernardino

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base and meridian, and flowing southeastward into San Fernando Valley. Santa Susana sheet.

Bee Canyon Creek; Tia Juana River basin; San Diego County; rises in the northeastern part of T. 18 S., R. 2 E., San Bernardino base and meridian, at altitude 1,500 feet above sea level; flows southward into Cottonwood Creek (tributary to Tia Juana River, which discharges to the Pacific); length, 3 miles; fall, 800 feet; intermittent. Cuyamaca sheet.

Bee Rock Canyon Creek; Santa Barbara County; an intermittent stream, 2 miles long, rising in the San Rafael Mountains in the southern part of Sisquoc Rancho and flowing northwestward into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Bell Canyon Creek; Los Angeles River basin; Ventura and Los Angeles counties; an intermittent stream, 2 miles long, rising in the Simi Hills and flowing eastward into San Fernando Valley. Calabasas sheet.

Bell Canyon Creek; Orange County; rises on the west slope of Los Pinos Peak, at altitude 3,500 feet above sea level; flows westward 4 miles, then southwesterly and southward 9 miles into San Juan Canyon Creek (tributary to the Pacific); fall, 3,150 feet. Elsinore and Corona sheets.

Bell Canyon Creek; San Gabriel River basin; Los Angeles County; an intermittent stream, about 2 miles long, rising in the northeastern part of T. 1 N., R. 9 W., San Bernardino base and meridian, and flowing southwestward to the head of Big Dalton Canyon. Pomona sheet.

Bell Canyon Creek; Santa Barbara County; formed by the union of Elwood and Winchester Canyon creeks. Elwood Canyon Creek rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, west of Brush Peak, at altitude 2,150 feet above sea level, and flows in general west of south to the head of Bell Canyon through which the southwesterly course is continued to the Pacific; length of Bell Canyon Creek below the mouth of Winchester Canyon Creek, about 1 mile; of Elwood above the mouth of Winchester, about 6 miles. Goleta special sheet.

Bell Creek; Trinity County; rises in the southeastern part of T. 7 N., R. 6 E., Humboldt base and meridian; flows southward into New River (tributary through Trinity River to Klamath River and thus to the Pacific); length, about 5 miles. Punnett's map of Trinity County.

Bell Rock Creek; Mendocino County; rises in the eastern part of T. 23 N., R. 15 W., Mount Diablo base and meridian, near Redwine; takes a general easterly course to its junction with Eel River (tributary to the Pacific); length, about 3 miles. Punnett's map of Mendocino County.

Bell Springs Creek; Mendocino County; rises in the eastern part of T. 24 N., R. 16, W., Mount Diablo base and meridian; flows north of east 5 miles, then southeastward 3 miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Mendocino County.

Belmont Creek; San Mateo County; rises in Pugas Rancho, southeast of San Mateo County almshouse; flows north of east to the tidal marsh at the south end of San Francisco Bay. San Mateo sheet.

Bend Canyon Creek, Big; Santa Maria River basin; Santa Barbara County; an intermittent stream, about 3 miles long, rising on the north slope of the San Rafael Mountains and flowing east and north to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Benedict Canyon Creek; Los Angeles County; an intermittent stream, 3½ miles long, draining a small area in the Santa Monica Mountains, and flowing southerly into Rodeo de las Aguas Rancho (drained by Ballona Creek, which discharges to Ballona Lagoon). Santa Monica sheet.

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Bennett Creek; Sonoma County; rises in the eastern part of T. 6 N., R. 7 W., Mount Diablo base and meridian; flows northwestward to its junction with Santa Rosa Creek (tributary to Russian River, which flows into the Pacific) at Santa Rosa; length, 10 miles. Punnett's map of Sonoma County. Called Matanzas Creek on Land Office map of California, 1907.

Bergona Lake; Mono County; south-central part of T. 3 N., R. 24 E., Mount Diablo base and meridian; 1 small inlet which may be considered the head of the West Fork of Green Creek; outlet, West Fork Green to Green Creek (tributary through Virginia Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); altitude, about 10,150 feet; very small. Bridgeport sheet.

Bernardo River. *See* San Dieguito River.

Berry Creek; San Mateo and Santa Cruz counties; rises in the southeastern part of T. 8 S., R. 4 W., Mount Diablo base and meridian; flows east of south into West Waddell Creek (tributary through Waddell Creek to the Pacific); length, about 2 miles. Santa Cruz sheet.

Berryessa Creek; Coyote River basin; Santa Clara County; rises in T. 6 S., R. 1 E., Mount Diablo base and meridian, on the west slope of Los Buellis Hills, at altitude 1,750 feet above sea level; flows irregularly westward to the valley of Coyote River (tributary to San Francisco Bay), in which it sinks north of Berryessa. San Jose sheet.

Bidwell, Lake; Lassen County; north-central part of T. 31 N., R. 6 E., Mount Diablo base and meridian; outlet, Butte Creek, which flows northward and sinks in the region west of Poison Lake; called Butte Lake on Starkweather's map of Lassen County. The lake is about 2 miles in greatest length, 1 mile in maximum width, and lies at an altitude of about 6,500 feet above sea level. Lassen Peak sheet.

Big Creek; Klamath River basin; Trinity County; rises in the northwestern part of T. 6 N., R. 8 E., Humboldt base and meridian; flows southwestward into New River (tributary through Trinity River to Klamath River and thus to the Pacific); length, about 8 miles. Punnett's map of Trinity County.

Big Creek; Scott Creek basin; Santa Cruz County; rises in the central part of T. 9 S., R. 3 W., Mount Diablo base and meridian, on the southern slope of Ben Lomond Mountain, near Eagle Peak, at altitude 2,400 feet above sea level; flows southerly 3 miles, then southwesterly about 4 miles to its junction with Scott Creek, which discharges to the Pacific. Santa Cruz sheet.

Big Lagoon; Humboldt County; T. 9 N., Rs. 1 E., and 1 W., Humboldt base and meridian; principal inlet, Maple Creek. Punnett's map of Humboldt County.

Big River; Mendocino County; rises in the east-central part of T. 17 N., R. 14 W., Mount Diablo base and meridian; flows southward 2 miles, then winds very irregularly westward to Mendocino Bay, where it enters the Pacific; length, including major windings, 34 miles; principal tributaries, Valentine and Martin creeks and South, Middle, and North forks. Punnett's map of Mendocino County.

Big River, Middle Fork; Mendocino County; rises in the southwestern part of T. 18 N., R. 14 W., Mount Diablo base and meridian; flows southwestward 4 miles, north of west 3 miles, then southward 4 miles to its junction with Big River (tributary to the Pacific) in the southwestern part of T. 17 N., R. 15 W.; principal tributaries, two unnamed streams which drain the southern part of T. 18 N., R 15 W. and enter from the north. Punnett's map of Mendocino County.

Big River, North Fork; Big River basin; Mendocino County; rises in the northern part of T. 17 N., R. 16 W., Mount Diablo base and meridian; flows

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irregularly southwestward to its junction with Big River (tributary to the Pacific) in the eastern part of T. 17 N., R. 17 W.; length, including major windings, about 6 miles. Punnett's map of Mendocino County.

Big River, South Fork; Mendocino County; rises in the western part of T. 16 N., R. 13 W., Mount Diablo base and meridian, flows irregularly westward to the western part of T. 16 N., R. 14 W., then northwestward to its junction with Big River; length, 14 miles; principal tributary, Dougherty Creek. Punnett's map of Mendocino County.

Big Sulphur Creek and other "Big" creeks. *See* the significant noun.

Billings Creek; Mendocino County; rises in the south-central part of T. 12 N., R. 13 W., Mount Diablo base and meridian, flows northwestward 4½ miles, then west of south 3 miles to its junction with North Fork of Gualala River (tributary through Gualala River to the Pacific). Punnett's map of Mendocino County.

Birch Creek; Owens Lake basin; Inyo County, Inyo National Forest; formed in the southern part of T. 7 S., R. 31 E., by two forks, one rising on the south slope of Mount Humphreys and the other on the north slope of Mount Emerson; flows northeastward to its junction with Owens River, which discharges into Owens Lake; length, to head of the fork draining the larger area, about 22 miles; fall below the forks, 3,200 feet. Mount Goddard and Bishop sheets.

Birch Creek; Owens Lake basin; Inyo County, Inyo National Forest; rises on the east slope of the Sierra, at altitude 12,500 feet above sea level; flows irregularly eastward to Owens Valley near the north end of Poverty Hills, where it unites with Tinemaha Creek; fall, 8,400 feet. Gaging station near Tinemaha (1905–1911). Bishop sheet.

Birch Creek; Santa Ana River basin; San Bernardino County; an intermittent stream, about 2 miles long, rising in the eastern part of T. 1 S., R. 1 W., San Bernardino base and meridian, and flowing southwestward to the head of Potato Canyon, which drains through Yucaipe Creek to San Timoteo Creek and thus to Santa Ana River, which discharges to the Pacific. San Gorgonio sheet.

Bishop Creek; Inyo County, Inyo National Forest; formed near the center of T. 8 S., R. 31 E., Mount Diablo base and meridian, by the union of its South and Middle forks. The South Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises about 1 mile northeast of Bishop Pass, at altitude 12,200 feet above sea level, and takes a general northerly course to its junction with the Middle Fork; below the forks the creek flows northeastward into Owens Valley. Gaging station near Bishop (1903–1911). Mount Goddard and Bishop sheets.

Bishop Creek, Middle Fork; Owens River basin; Inyo County, Inyo National Forest; rises on the north slope of Mount Powell (altitude 13,361 feet); flows northward and northeastward to its junction with the South Fork, with which it forms Bishop Creek (tributary to Owens River, which discharges to Owens Lake); passes through Lake Sebrina; fall, 4,800 feet. Mount Goddard sheet.

Bishop Creek, North Fork; Owens River basin; Inyo County, Inyo National Forest; rises on the east slope of the Sierra, near Piute Pass, at altitude 11,400 feet above sea level; flows eastward into Middle Fork of Bishop Creek (tributary through Bishop Creek to Owens River, which discharges to Owens Lake); length, 5 miles; fall, 2,900 feet; passes through several small lakes. Mount Goddard sheet.

Bitter Creek; Klamath River basin; Trinity County; rises in the western part of T. 2 N., R. 8 E., Humboldt base and meridian; flows northwestward 4 miles, then in general south of west 4 miles to its junction with Indian Valley

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Creek (tributary through South Fork of Trinity River to Trinity River and thus to the Klamath, which discharges to the Pacific). Punnett's map of Trinity County.

Bitter Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, about 3½ miles long, rising in the northern part of T. 5 N., R. 16 W., San Bernardino base and meridian, and flowing southwestward into Charlie Canyon Creek (tributary to Castac Creek and thus to Santa Clara River, which discharges to the Pacific). Tejon and Santa Susana sheet.

Bitter Creek; Santa Clara River basin; Ventura County; rises in the northwestern part of T. 8 N., R. 21 W., San Bernardino base and meridian, on the eastern slope of Mount Pinos, at altitude 7,800 feet above sea level; flows southeastward 5 miles to north edge of Lockwood Valley, which is drained by Lockwood Creek to Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); fall in the 4 miles above the mouth of the canyon, 2,300 feet; intermittent. Mount Pinos sheet.

Bitter Dry Lake; San Bernardino County; Tps. 13 and 14 N., R. 5 E., San Bernardino base and meridian. The spring near the southeast end of this lake is the first watering place reached by the traveler on the old emigrant road to Salt Lake City; it has been known since 1852; the water contains too much sodium sulphate to be wholesome, but it can be used. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, p. 61.

Bitterwater Creek; Salinas River basin; Monterey County; rises in the southern part of T. 21 S., R. 12 E., Mount Diablo base and meridian; flows southwestward to the valley of Salinas River (tributary to the Pacific in Monterey Bay) 6 miles southeast of San Ardo; sinks before reaching the river; length, about 12 miles; tributary, Powell Creek. Land Office map of California, 1907.

Bitterwater Creek; Salinas River basin; San Benito County; rises in the northeastern part of T. 18 S., R. 9 E., Mount Diablo base and meridian, a short distance northeast of Bitterwater; flows irregularly southward to Loanoke (spelled Lonoak on the post route map), where it joins San Lorenzo Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 8 miles; its principal tributary, Lewis Creek, is much longer and drains a much larger area than the creek itself. Land Office map of California, 1907.

Bixby Slough; Los Angeles County; occupies a completely inclosed depression just northwest of Wilmington. Redondo sheet.

Black Bear Creek; Siskiyou County; rises in the southern part of T. 39 N., R. 11 W., Mount Diablo base and meridian; flows northwestward about 4 miles, then southwestward 6 miles to its junction with Salmon River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Black Canyon Creek; San Diego County; rises in the southwestern part of T. 11 S., R. 2 E., San Bernardino base and meridian, at altitude 3,400 feet; flows southward 4 miles into Santa Ysabel Creek (San Dieguito River, which discharges to the Pacific); intermittent; fall, 1,700 feet. Ramona sheet.

Black Hawk Canyon Creek; San Bernardino County; T. 3. N., R. 2 E.; an intermittent stream, 3 miles long, flowing northward to Mohave Desert. San Gorgonio sheet.

Black Lake; San Luis Obispo County; in Bolsa de Chamisal Rancho 1½ miles east of the coast; receives the drainage of Black Lake Canyon. Arroyo Grande sheet.

Black Lake Canyon Creek; San Luis Obispo County; rises in Nipomo Rancho and flows westward 3 miles into Black Lake; marshy. Arroyo Grande sheet.

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Black Rabbit Canyon Creek; Riverside County; an intermittent stream, about 3 miles long, flowing south of east into Martinez Canyon Creek, which discharges to the Colorado Desert. Indio special sheet.

Black Star Canyon Creek; Orange County; rises on the east slope of the Santa Ana Mountains, at altitude 2,500 feet above sea level; flows southwestward 4 miles into Santiago Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 1,600 feet. Corona sheet.

Blacksmith Creek; Mono County; rises in the eastern part of T. 3 N., R 23 E., Mount Diablo base and meridian, on the north slope of Sawtooth Ridge, at altitude 10,500 feet above sea level; flows east of north 2½ miles to its junction with Robinson Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake) half a mile above upper Twin Lake; fall, 3,300 feet. Bridgeport sheet.

Blackwood Creek; Placer County; rises in the northwestern part of T. 14 N., R. 16 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows northward and northeastward and enters Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes) near McKinney; length, 5 miles; fall, 1,775 feet. Truckee sheet.

Blaisdell Canyon; Riverside County; Tps. 4 and 3 S., R. 3 E., San Bernardino base and meridian; opens northeastward toward Whitewater River, which discharges to Colorado Desert. San Jacinto sheet.

Blanchard Canyon Creek; Ventura County; an intermittent stream, 1½ miles long, flowing eastward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) in Temescal Rancho. Camulos sheet.

Blooms Creek; Santa Cruz County; rises near Blooms Mill, in the northern part of T. 9 S., R. 3 W., Mount Diablo base and meridian; flows westward into East Waddell Creek (tributary through Waddell Creek to the Pacific); principal tributary, Sempervirens Creek. Santa Cruz sheet.

Blue Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest on the north slope of the Santa Ynez Mountains, at altitude 3,250 feet above sea level; flows in general northwestward to its junction with Santa Ynez River (tributary to the Pacific) 2 miles above the mouth of Mono Creek; length, about 5 miles; fall, 1,750 feet. Santa Barbara special and Santa Ynez sheets.

Blue Creek; Del Norte and Humboldt counties; rises in Del Norte County in the eastern part of T. 14 N., R. 4 E., Humboldt base and meridian; flows southwestward 20 miles and unites with Klamath River (tributary to the Pacific) in Humboldt County, in the central part of T. 12 N., R. 2 E.; no tributaries named on the map. Punnett's map of Del Norte County.

Blue Lake; Mono County; southwestern part of T. 2 N., R. 25 E., Mount Diablo base and meridian; the smallest of several lakes through which Lake Canyon Creek flows to its junction with Mill Creek (tributary to Mono Lake); altitude, about 9,450 feet. Bridgeport sheet.

Blue Rock Creek; Mendocino County; rises in the northern part of T. 23 N., R. 15 W., Mount Diablo base and meridian; flows northwestward, northward, and then north of east to its junction with Eel River (tributary to the Pacific); length, about 9 miles. Punnet's map of Mendocino County.

Bluff Creek; Del Norte and Humboldt counties; rises in Del Norte County in the central part of T. 13 N., R. 4 E., Humboldt base and meridian; flows in general somewhat east of south to its junction with Klamath River (tributary to the Pacific) in the southwestern part of T. 10 N., R. 5 E.; length, including major windings, 21 miles; many small tributaries but none named on maps. Punnett's maps of Del Norte and Humboldt counties

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Bluff Lake; San Bernardino County; southeastern part of T. 2 N., R. 1 W., San Bernardino base and meridian; a small marshy lake discharging through Lake Creek to Bear Creek (tributary to Santa Ana River, which discharges to the Pacific); altitude, 7,450 feet above sea level. San Gorgonio sheet.

Bob Canyon Creek; Los Angeles County; rises in the southwestern part of T. 4 N., R. 8 W., San Bernardino base and meridian, on the north slope of Pinon Ridge, at altitude 6,100 feet; flows northwestward toward the Mohave Desert, where its waters sink; about 3 miles long. San Antonio and Rock Creek sheets.

Bodie Creek; California-Nevada; rises in Mono County, Cal., on the east slope of Bodie Mountain, at altitude 9,300 feet above sea level; flows south of east 3 miles to Bodie, northeastward 14 miles to a point north of Fletcher, Nev., and then northwestward 2 miles to its junction with Rough Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); fall, 3,300 feet. Bridgeport and Hawthorne sheets.

Bogess Creek; San Gregorio Creek basin; San Mateo County; an intermittent stream, 5 miles long, rising in T. 6 S., R. 4 W., Mount Diablo base and meridian, and flowing west of south to its junction with San Gregorio Creek, which discharges to the Pacific. Santa Cruz sheet.

Bogus Creek; Siskiyou County; rises in the eastern part of T. 46 N., R. 4 W., Mount Diablo base and meridian, on the west slope of Willow Creek Mountain, at altitude 5,000 feet above sea level; flows northwestward 14 miles to its junction with Klamath River (tributary to the Pacific); fall, 2,800 feet. Shasta sheet.

Bogus Creek, Little; Klamath River basin; Siskiyou County; rises in the southern part of T. 47 N., R. 5 W., Mount Diablo base and meridian; on the north slope of Bogus Mountain, at altitude 3,300 feet above sea level; flows north of west 4 miles to its junction with Klamath River (tributary to the Pacific); fall, 1,100 feet; intermittent. Shasta sheet.

Boise Creek; Humboldt County; rises in the east-central part of T. 10 N., R. 6 E., Humboldt base and meridian; flows in general somewhat north of west to its junction with Klamath River (tributary to the Pacific); length, about 6 miles. Punnett's map of Humboldt County.

Bolam Creek; Siskiyou County; flows from Bolam Glacier on the north slope of Mount Shasta (altitude 14,380 feet) northwestward to its junction with Whitney Creek (q. v.). Shasta special map.

Boles Creek; Siskiyou County; rises in the northeastern part of T. 41 N., R. 5 W., Mount Diablo base and meridian; flows northwestward 5 miles; unites with Shasta River (tributary to Klamath River, which flows to the Pacific) near Butteville; fall, 800 feet. Shasta sheet.

Bolinas Creek; San Lorenzo Creek basin; Alameda County; rises in the southwestern part of T. 1 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows southeastward about 3 miles into Crow Creek (tributary through Cull Creek to San Lorenzo Creek, which discharges to San Francisco Bay); fall, 1,000 feet. Concord sheet.

Bolsas Creek; Orange County; the channel through the tidal marsh in the southern part of La Bolsa Chica Rancho. Downey sheet.

Boneyard Canyon; Los Angeles County; a drainage way in the eastern part of T. 4 N., Rs. 7 and 8 W., San Bernardino base and meridian, sending its flood waters northward into the Mohave Desert. San Antonio sheet.

Bonito Creek; Alameda Creek basin; Santa Clara County; an intermittent stream, 5 miles long, rising on the eastern slope of Mount Day in the northwestern part of T. 6 S., R. 3 E., Mount Diablo base and meridian, and flowing southeastward into Isabel Creek (tributary through Arroyo Hondo to Cala-

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veras Creek, and thus through Alameda Creek to San Francisco Bay); fall, 1,100 feet. Mount Hamilton sheet.

Bottle Creek; Modoc County; rises in the northern part of the county, 4 miles west of Timbered Mountain; flows northwestward into South Fork of Willow Creek (tributary through Willow Creek to Lost River, which discharges to Rhett Lake); length, 2 miles. Alturas sheet.

Boulder Canyon Creek; Ventura County; an intermittent stream, 3 miles long, rising in the southern part of T. 7 N., R. 23 W., San Bernardino base and meridian; flows northwestward into Cuyama River (Santa Maria River, which discharges to the Pacific). Mount Pinos sheet.

Boulder Creek; Mad River basin; Humboldt County; rises in the central part of T. 4 N., R. 4 E., Humboldt base and meridian, between Mount Andy and Chaparral Mountain; flows northwestward into Mad River (tributary to the Pacific); length, about 8 miles. Punnett's map of Humboldt County.

Boulder Creek; Klamath River basin; Trinity County; rises in the western part of T. 37 N., R. 8 W., Mount Diablo base and meridian; flows northeastward 4 miles into Coffee Creek (tributary to Trinity River, which discharges through Klamath River to the Pacific). Punnett's map of Trinity County.

Boulder Creek; San Diego River basin; San Diego County; rises in Cuyamaca Reservoir at altitude 4,800 feet above sea level; flows irregularly westward into San Diego River, which discharges to the Pacific through False Bay; length, about 12 miles; fall, 4,000 feet. Cuyamaca sheet.

Boulder Creek; San Lorenzo River basin; Santa Cruz County; rises in the southern part of T. 8 S., R. 3 W., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows southeastward 7 miles into San Lorenzo River (tributary to the Pacific) at the town of Boulder Creek; fall, 1,200 feet. Santa Cruz sheet.

Boulder Creek; Santa Clara River basin; Ventura County; an intermittent stream, about 3 miles long, rising on the western slope of San Cayetano Mountain and flowing southeastward toward the wash of Sespe Creek (tributary to Santa Clara River); fall in the 2½ miles above the mouth of the canyon, about 2,000 feet. Camulos sheet.

Boulder Creek, Little; Trinity County; rises in the central part of T. 37 N., R. 8 W., Mount Diablo base and meridian; flows northeastward 3 miles to its junction with Coffee Creek (tributary to Trinity River and thus through Klamath River to the Pacific). Punnett's map of Trinity County.

Boulder. *See also* Bowlder.

Bouton Lake; San Gabriel River basin; Los Angeles County; 5 miles north of Long Beach; the map (Downey sheet) shows outlet eastward toward San Gabriel River.

Bowlder Creek; Klamath River basin; Siskiyou County; rises in the northeastern part of T. 39 N., R. 8 W., Mount Diablo base and meridian, in Bowlder Lake, on the west slope of Scott Mountain; flows westward 4 miles, then northward 3 miles to junction with South Fork of Scott River (tributary through Scott River to Klamath River, which discharges to the Pacific); principal tributary, a stream (unnamed on the map) about 9 miles long, rising in a small lake near the center of T. 38 N., R. 8 W., and flowing, in general, northward. Punnett's map of Siskiyou County.

Bowlder Creek; Klamath River basin; Siskiyou County; rises in the southeastern part of T. 17 N., R. 6 E., Humboldt base and meridian; flows in general southward to its junction with Clear Creek (tributary to Klamath River, which flows to the Pacific); length, 10 miles. Punnett's map of Siskiyou County.

Bowlder Lake; Siskiyou County; northeastern part of T. 39 N., R. 8 W., Mount Diablo base and meridian, on west slope of Scott Mountain; outlet,

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Bowlder Creek to South Fork of Scott River (tributary through Scott River to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Boynton Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends westward from Suisun Creek. Napa sheet.

Bradley Canyon; Riverside County; northeastern part of T. 5 S., R. 5 E.; an intermittent stream, about 2 miles long, flowing northeastward to Whitewater River. Indio special sheet.

Braley Creek; Inyo County; rises on the east slope of the Sierra at altitude 9,000 feet above sea level; flows eastward to the edge of Owens Valley where its waters sink; length, about 3 miles; fall, 4,800 feet. Olancha sheet.

Branch Canyon Creek; Santa Barbara County; an intermittent stream, rising in Salisbury Potrero, in the southwestern part of T. 9 N., R. 26 W., San Bernardino base and meridian, and flowing northward toward Cuyama River (Santa Maria River, which discharges to the Pacific) in Cuyama No. 1. Santa Ynez sheet.

Branciforte Creek; San Lorenzo River basin; Santa Cruz County; rises in the northwestern part of T. 10 S., R. 1 W., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows somewhat west of south to the city of Santa Cruz, where it enters San Lorenzo River; length, about 8 miles. Santa Cruz sheet.

Brea Canyon Creek; Los Angeles and Orange counties; rises in the central part of T. 2 S., R. 9 W., San Bernardino base and meridian, at altitude 900 feet above sea level; flows southwestward 11 miles, then westerly 6 miles to its junction with Coyote Creek (tributary to San Gabriel River, which discharges to the Pacific); fall, 850 feet; intermittent. Anaheim and Downey sheets.

Breakneck Creek; Los Angeles River basin; Los Angeles County; an intermittent stream, about 2 miles long, flowing southward into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific) about 2 miles above Hoyt Ranch. Tujunga sheet.

Breakneck Creek; Santa Ana River basin; San Bernardino County; rises in the northwestern part of T. 1 N., R. 1 W., San Bernardino base and meridian, at altitude 6,750 feet above sea level; flows southward 1½ miles, then southeastward 1 mile into Santa Ana River, which discharges to the Pacific; fall, 1,900 feet; intermittent. Redlands sheet.

Bridge Creek; Lassen County; rises in the central part of T. 31 N., R. 9 E., Mount Diablo base and meridian; flows southeastward 18 miles to its junction with Susan River (tributary to Honey Lake); fall, about 900 feet. Honey Lake sheet.

Bridgeport Canyon Creek; Mono County; rises in the northern part of T. 3 N., R. 26 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows southeastward into Mono Lake; fall, about 1,900 feet; intermittent. Bridgeport sheet.

Bristol Dry Lake; San Bernardino County; Tps. 4 and 5 N., Rs. 11, 12, and 13 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Brizziolari Creek; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains in T. 30 S., R. 12 E., Mount Diablo base and meridian; flows southwestward and southward, and joins San Luis Obispo Creek (which discharges to the Pacific) near the western edge of the city of San Luis Obispo; length, about 4 miles. San Luis Obispo sheet.

Bronco Creek; Nevada County; rises in Washoe County, Nev., on the west slope of Mount Rose, at altitude 9,600 feet above sea level; flows in general north of west 6 miles, then southwestward 2 miles to its junction with Truckee

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River (tributary to Pyramid and Winnemucca lakes) in the southwestern part of T. 18 N., R. 18 E.; fall, 4,100 feet. Carson and Truckee sheets.

Brown Canyon Creek; Ballona Creek basin; Los Angeles County; an intermittent stream, about 6½ miles long, draining a small area in the Santa Monica Mountains, and flowing east of south to a point near Palms, where its waters sink. Santa Monica sheet.

Brown Canyon Creek; Santa Ana River basin; Riverside County; an intermittent stream 3 miles long; flows northeastward into Temescal Wash. Corona and Elsinore sheets.

Browns Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream rising on the southern slope of Santa Susana Mountains, in T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing southeastward to San Fernando Valley. Santa Susana sheet.

Browns Creek; Klamath River basin; Trinity County; rises in the west-central part of T. 34 N., R. 9 W., Mount Diablo base and meridian; flows somewhat east of south 4 miles, then southwestward 4½ miles to its junction with Weaver Creek (tributary through Trinity River to Klamath River, which discharges to the Pacific) 2 miles southeast of Weaverville. Punnett's map of Trinity County.

Browns Creek; Klamath River basin; Trinity County; rises in the central part of T. 30 N., R. 10 W., Mount Diablo base and meridian; flows southeastward 2 miles, then takes a general northerly course to its junction with Trinity River (tributary to the Klamath, which discharges to the Pacific) in the southern part of T. 33 N., R. 10 W.; length, about 20 miles. Punnett's map of Trinity County.

Browns Creek; Pajaro River basin; Santa Cruz County; rises in the southwestern part of T. 10 S., R. 2 E., Mount Diablo base and meridian; flows irregularly southward, and joins Pajaro River (tributary to the Pacific in Monterey Bay) near Watsonville; length, about 15 miles. Land Office map of California, 1907.

Browns Gulch Creek; Klamath River basin; Del Norte County; rises in the southern part of T. 13 N., R. 1 E., Humboldt base and meridian; flows northward 2 miles into Klamath River (tributary to the Pacific). Punnett's map of Del Norte County.

Browns Gulch Creek; San Gabriel River basin; Los Angeles County; rises in southeastern part of T. 2 N., R. 10 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows southeastward 2½ miles into San Gabriel River; fall, 2,050 feet; intermittent. Pomona sheet.

Browns Lake; Humboldt County; eastern part of T. 10 N., R. 4 E., Humboldt base and meridian; inlets, two streams draining the northern and eastern slopes of Rivet Mountain; outlet, a stream half a mile long flowing northeastward into Bluff Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Humboldt County.

Brush Canyon Creek; Ballona Creek basin; Los Angeles County; an intermittent stream, about 2 miles long, flowing southward into La Brea Rancho. Santa Monica sheet.

Brush Creek; Eel River basin; Mendocino County; rises in the northwestern part of T. 23 N., R. 15 W., Mount Diablo base and meridian; flows southward 2 miles into Rattlesnake Creek (tributary to South Fork of Eel River and thus to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Brush Creek; Klamath River basin; Siskiyou County; rises in the southwestern part of T. 48 N., R. 5 W., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows southeastward 4 miles into Klamath River

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(tributary to the Pacific) opposite the mouth of Bogus Creek; fall, 900 feet; intermittent. Shasta sheet.

Brush Creek; Mendocino County; rises in the southern part of T. 13 N., R. 15 W., Mount Diablo base and meridian; flows westward and enters the Pacific 2 miles northeast of Point Arena; length, about 12 miles. Punnett's map of Mendocino County.

Bryant Creek; Alpine County, Cal., Douglas County, Nev.; formed in the eastern part of Alpine County by the union of Leviathan and Mountaineer creeks, at altitude 6,200 feet above sea level; flows northwestward to its junction with East Fork of Carson River (tributary through Carson River to Carson Sink) in Douglas County, Nev.; length, about 6 miles; fall, about 1,100 feet. Markleeville sheet.

Buck Canyon Creek; Los Angeles River basin, Los Angeles County; rises in the Angeles National Forest, at altitude 2,950 feet above sea level; flows south of east 2 miles into Little Tujunga Creek; fall, 1,200 feet. Fernando sheet.

Buck Creek; Ventura County; rises in the northern part of T. 6 N., R. 19 W., San Bernardino base and meridian, on the southern slope of Snowy Peak, at altitude 5,800 feet above sea level; flows northeastward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 5 miles; fall, 3,200 feet. Tejon sheet.

Buck Mountain Creek; Humboldt County; rises in the central part of T. 4 S., R. 4 E., Humboldt base and meridian; flows southwestward 3 miles into East Branch of South Fork of Eel River (tributary through South Fork of Eel to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Buckeye Creek; Gualala River basin; Sonoma County; rises in the southeastern part of T. 11 N., R. 13 W., Mount Diablo base and meridian; flows very irregularly southwestward to its junction with Gualala River (tributary to the Pacific) in the northwestern part of T. 10 N., R. 14 W.; length, including major windings, about 14 miles; principal tributaries, Prosser and Grasshopper creeks. Punnett's map of Sonoma County.

Buckeye Creek; Klamath River basin; Trinity County; rises in the eastern part of T. 37 N., R. 8 W., Mount Diablo base and meridian, at altitude 5,200 feet above sea level; flows southeastward to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 3 miles; fall, 2,900 feet. Shasta sheet.

Buckeye Creek; Klamath River basin; Trinity County; rises in the western part of T. 34 N., R. 8 W., Mount Diablo base and meridian, at altitude 2,800 feet above sea level; flows northwestward 2 miles, then northeastward 3 miles to its junction with Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); fall, 1,200 feet. Red Bluff sheet.

Buckeye Creek; Walker River basin; Mono County; formed in the southwestern part of T. 4 N., R. 23 E., Mount Diablo base and meridian, by the union of its North and South forks. The South Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the northwestern part of T. 3 N., R. 23 E., on the south slope of Center Mountain at altitude 10,300 feet above sea level; encircles the east base of the mountain and passes to the northwest and north to its junction with the North Fork; below the forks Buckeye Creek flows northeastward to its junction with East Walker River (tributary to Walker River, which discharges to Walker Lake) at the lower end of Bridgeport Valley, 3 miles north of Bridgeport; length, to

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head of South Fork, including major windings, about 21 miles; fall, about 3,850 feet, of which 3,300 feet is made in the 13 miles above Buckeye Hot Springs; principal tributaries, Eagle and Swager creeks. Gaging station near Bridgeport (1910-1912). Bridgeport sheet.

Buckeye Creek, North Fork; Walker River basin; Mono County; rises in the eastern part of T. 4 N., R. 22 E., Mount Diablo base and meridian, at altitude 9,700 feet above sea level; flows southeastward 2 miles to its junction with South Fork with which it forms Buckeye Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); fall, about 1,200 feet. Dardanelles and Bridgeport sheets.

Buckhorn Canyon Creek; Santa Barbara County; an intermittent stream rising in the northwestern part of T. 10 N., R. 31 W., San Bernardino base and meridian, and flowing northwestward to Cuyama River (Santa Maria River, which dischages to the Pacific). Lompoc sheet.

Buckhorn Creek; Klamath River basin; Siskiyou County; rises in the northeastern part of T. 47 N., R. 10 W., Mount Diablo base and meridian; flows in general west of south to its junction with Horse Creek, through which it is tributary to Klamath River (tributary to the Pacific); length, 8 miles. Punnett's map of Siskiyou County.

Buckhorn Creek; Santa Ynez River basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the north slope of Little Pine Mountain, at altitude 4,000 feet above sea level; flows southeastward 5 miles into Indian Creek (tributary to Mono Creek and thus to Santa Ynez River, which discharges to the Pacific); fall, 2,100 feet. Santa Ynez sheet.

Buckhorn Dry Lake; Kern County; Tps. 8 and 9 N., Rs. 10 and 11 W., San Bernardino base and meridian; contains water only during and immediately after heavy storms. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 14 and Pl. VI. *See* Three Sisters Lake.

Buckner Creek; Eel River basin; Lake and Mendocino counties; rises in the south-central part of T. 17 N., R. 10 W., Mount Diablo base and meridian; flows in general northwestward to its junction with Eel River (tributary to the Pacific); length, about 9 miles. Punnett's map of Mendocino and Lake counties.

Buena Vista Creek; San Diego County; rises in the north-central part of T. 11 S., R. 3 W., San Bernardino base and meridian, on the west slope of the San Marcos Mountains, at altitude 1,200 feet above sea level; flows southwestward and westward and discharges into a brackish-water marsh 2 miles southeast of Oceanside; intermittent; length to head of marsh, about 10 miles. The marsh is separated from the Pacific by a narrow sand bar which at times may be cut through by the flood water of the creek. Escondido and Oceanside sheets.

Buena Vista Creek; San Luis Rey River basin; San Diego County; an intermittent stream whose drainage line is not well marked on the map; heading near Buena Vista, flowing northwest and then southwest to its junction with Carrizo Creek (tributary to San Luis Rey River, which discharges to the Pacific). Ramona sheet.

Bug Creek; Humboldt County; rises in the southern part of T. 4 N., R. 4 E., Humboldt base and meridian, on Chapparal Mountain; flows southward 3 miles into Mad River (tributary to the Pacific). Punnett's map of Humboldt County.

Bull Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream rising on the southern slope of Mission Point and flowing southeastward to San Fernando Valley. Santa Susana sheet.

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Bull Creek; Humboldt County; rises in the southwestern part of T. 2 S., R. 2 E., Humboldt base and meridian; flows northwestward 4 miles, then winds to the north and east to its junction with South Fork of Eel River (tributary to Eel River, which discharges to the Pacific) half a mile southwest of Dyerville; length, 11 miles. Punnett's map of Humboldt County.

Burger Creek; Eel River basin; Mendocino County; rises in the western part of T. 21 N., R. 14 W., Mount Diablo base and meridian, 2 miles southeast of Laytonville; flows northeastward 7 miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Mendocino County.

Burns Canyon Creek; San Bernardino County; rises in the northeastern part of T. 1 N., R. 3 E., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows southeastward 6 miles into Pipes Creek, which discharges through Antelope Creek to the Colorado Desert; intermittent. San Gorgonio sheet.

Burnside Lake; Alpine County; about 6 miles north of west from Markleeville; a small, marshy lake; no outlet mapped; altitude, about 8,200 feet. Markleeville sheet.

Burnt Mill Creek; Mohave River basin; San Bernardino County; rises in the south-central part of T. 2 N., R. 3 W., San Bernardino base and meridian, at altitude 5,700 feet above sea level; flows northward to Little Bear Creek (tributary to Deep Creek, which discharges to Mohave River); length, 1 mile; fall, 650 feet. Redlands and Deep Creek sheets.

Burr Creek; Humboldt County; rises in the southwestern part of T. 1 N., R. 4 E., Humboldt base and meridian; flows southwestward into Larribee Creek (tributary to Eel River, which discharges to the Pacific); length, 4 miles. Punnett's map of Humboldt County.

Burrow Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the west-central part of T. 2 N., R. 9 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows west of south into San Gabriel River, which discharges to the Pacific; length, 2 miles; fall, 1,600 feet; intermittent. Rock Creek and Pomona sheets.

Butano Creek; San Mateo County; rises in the western part of T. 8 S., R. 3 W., on the west slope of Butano Ridge at altitude 2,000 feet above sea level; flows north of west 5 miles, southwestward 4 miles, then again northwestward 5 miles to its junction with Pescadero Creek (which discharges to the Pacific) just above its mouth; principal tributary, Little Butano Creek. Santa Cruz sheet.

Butano Creek, Little; San Mateo County; rises in the south-central part of T. 8 S., R. 4 W., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows southwestward 4 miles, then northwestward 1 mile into Butano Creek (tributary to Pescadero Creek, which discharges to the Pacific); fall, 1,100 feet. Santa Cruz sheet.

Butler Creek; Siskiyou County; rises in the east-central part of T. 11 N., R. 6 E., Humboldt base and meridian, on the east slope of Orleans Mountains; flows, in general, somewhat north of east to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Butte Creek; Lassen County; rises in Lake Bidwell in the north-central part of T. 31 N., R 6 E.; flows northward about 7 miles; sinks in the region west of Poison Lake. Lassen Peak sheet (on which it is not named) and Starkweather's map of Lassen County.

Butte Dry Lake; Kern County; T. 11 N., R. 9 W., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Butte Lake. *See* Bidwell Lake.

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Cabin Creek; Monterey County; rises in the northwestern part of T. 26 S., R. 9 E., Mount Diablo base and meridian; flows northeastward into Franklin Creek (tributary through Sierra River to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 6 miles. Land Office map of California, 1907.

Cable Canyon Creek; Santa Ana River basin; San Bernardino County; rises in the central part of T. 2 N., R. 5 W., San Bernardino base and meridian, at altitude 5,000 feet above sea level; flows southward and southwestward and enters the valley at an altitude of about 2,200 feet above sea level. San Bernardino sheet.

Cachuma Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of Cachuma Mountain, at altitude 4,000 feet above sea level; flows west of south 10 miles to its junction with Santa Ynez River, which discharges to the Pacific; fall, 3,500 feet; intermittent. Santa Ynez sheet.

Cadiz Dry Lake; San Bernardino County; Tps. 2 and 3 N., Rs. 14, 15, and 16 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Cajalco Canyon Creek; Riverside County; an intermittent stream, 4 miles long, flowing westward into Temescal Wash (tributary to Santa Ana River, which discharges to the Pacific) 5 miles southeast of Corona. Elsinore sheet.

Cajon Canyon Creek; Santa Ana River basin; San Bernardino County; drains the area lying east of north of Lytle Creek; comes to the west end of San Bernardino Valley, and except in years of great rainfall, when it turns a point of mountain adjoining Lytle Creek, it seldom flows farther than the upper edge of the great plain. Its drainage area comprises 62 square miles, nearly one-third of it draining to Lone Pine Canyon. Hesperia, San Antonio, and San Bernardino sheets; Hall, Wm. Ham., Irrigation in California [southern]: Second part of the report of the State Engineer of California on irrigation and the irrigation question, Sacramento, 1888, p. 123.

Calabazas Creek; Guadalupe River basin; Santa Clara County; a stream rising in the southeastern part of T. 7 S., R. 2 W., Mount Diablo base and meridian, flowing northeastward, and discharging to Guadalupe Slough, the channel through which Guadalupe River enters San Francisco Bay. Santa Cruz and San Jose sheets.

Calabazas Creek; Sonoma Creek basin; Sonoma County; rises in the southeastern part of T. 7 N., R. 6 W., Mount Diablo base and meridian, at altitude about 1,500 feet above sea level; takes a general southwesterly course to its junction with Sonoma Creek (tributary to San Pablo Bay) in the central part of T. 6 N., R. 6 W.; length, about 4 miles. Napa sheet.

Calaveras Creek; Alameda Creek basin; Santa Clara and Alameda counties; rises in T. 6 S., R. 2 E., Mount Diablo base and meridian, on the west slope of Poverty Ridge, at altitude 3,000 feet above sea level; takes a general northwesterly course to its junction with Alameda Creek, which discharges to San Francisco Bay; length, about 8 miles; fall, 2,500 feet; principal tributary, Arroyo Hondo; intermittent through Calaveras Valley. Mount Hamilton, San Jose, and Pleasanton sheets.

Calera Creek; Santa Clara County; rises in T. 5 S., R. 1 E., Mount Diablo base and meridian, on the south slope of Monument Peak, at altitude 2,200 feet above sea level; flows southwestward about 4½ miles to its junction with Penitencia Creek (tributary to Coyote River, which discharges to San Francisco Bay). San Jose sheet.

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Calera Valley Creek; San Mateo County; an intermittent stream, about 2 miles long, rising on the western slope of Sweeney Ridge, in San Pedro Rancho, and flowing westward into the Pacific Ocean. San Mateo sheet.

Caliente Canyon Creek, Little; Santa Barbara County; an intermittent stream, 3 miles long, rising in the Santa Barbara National Forest and flowing southwestward into Mono Creek (tributary to Santa Ynez River, which discharges to the Pacific) about 1 mile above its mouth. Santa Ynez sheet.

Callahan Gulch Creek; Alameda County; an intermittent stream, about 3 miles long, rising in the northeastern part of T. 5 S., R. 4 E., Mount Diablo base and meridian, at altitude 2,800 feet above sea level; flows northwestward to Arroyo Mocho (tributary through Arroyo las Positas to Arroyo de la Laguna, and thus to Alameda Creek, which discharges to San Francisco Bay). Tesla sheet.

Calleguas Creek; Ventura County; rises near Santa Susana Pass, north of Chatsworth Peak and south of Rocky Peak; flows westerly and southwesterly to Mugu Laguna, through which it enters the Pacific. The name Calleguas Creek is applied to the stretch below Las Posas; from Somis to Moorpark it is called Arroyo Las Posas; and in Simi Valley, near its head, it takes the name Arroyo Simi; only its flood waters reach the ocean; the principal tributary is Canejo Creek. Camulos and Hueneme sheets.

Cameros Valley Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 2,000 feet above sea level; flows southerly through Bartlett Canyon and Cameros Valley; sinks before reaching the tidal marsh through which this part of Santa Barbara County is drained to the Pacific; length, about 5 miles; tributary, Dry Creek. Goleta special sheet.

Camp Creek; Klamath River basin; Jackson County, Oreg., and Siskiyou County, Cal.; rises in the southern part of T. 40 S., R. 3 E., Willamette meridian, at altitude 5,000 feet above sea level; flows southeastward 8 miles into Klamath River (tributary to the Pacific) in the northern part of T. 47 N., R. 5 W., Mount Diablo base and meridian; fall, 2,600 feet. Ashland and Shasta sheets; Land Office maps of Oregon and California; Punnett's map of Siskiyou County.

Camp Creek; Klamath River basin; Siskiyou and Humboldt counties; rises in the eastern part of T. 13 N., R. 4 E., Humboldt base and meridian; takes an irregular but in general southeasterly course to its junction with Klamath River (tributary to the Pacific) near Orleans, in the extreme northeastern part of T. 10 N., R. 5 E.; length, including major windings, 19 miles. Punnett's map of Siskiyou and Humboldt counties.

Camp Creek; Santa Ana River basin; San Bernardino County; rises in the southwestern part of T. 2 N., R. 1 W., San Bernardino base and meridian; at altitude 6,750 feet above sea level; flows southeastward into Bear Creek (tributary to Santa Ana River, which discharges to the Pacific); length, 1 mile; fall, 3,000 feet; intermittent. Redlands sheet.

Campbell Creek; Guadalupe River basin; Santa Clara County; rises in the southeastern part of T. 8 S., R. 2 W., Mount Diablo base and meridian, on the east slope of Castle Rock Ridge, at altitude 2,800 feet above sea level; flows northward to Congress Springs, then northeastward to Guadalupe Slough, the channel through which Guadalupe River enters San Francisco Bay; principal tributary, San Tomas Aquinas Creek. Santa Cruz and San Jose sheets.

Campbell Creek; Klamath River basin; Humboldt County; rises in the south-central part of T. 7 N., R. 4 E., Humboldt base and meridian; flows northeastward 5 miles into Trinity River (tributary to Klamath River, which

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discharges to the Pacific) in the southern part of Hoopa Valley Indian Reservation. Punnett's map of Humboldt County.

Campo Creek; San Diego County; rises in the northern part of T. 17 S., R. 6 E., San Bernardino base and meridian; flows west of south across the Mexican boundary. The stream to which it is tributary is not shown on the available maps and is unknown to the compiler. Cuyamaca sheet.

Camuesa Canyon Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising 1½ miles southeast of Little Pine Mountain and flowing southeastward to Santa Ynez River (tributary to the Pacific), which it reaches only in time of flood. Santa Ynez sheet.

Canada Agua Caliente Creek; San Diego County; rises in the northwestern part of T. 10 S., R. 4 E., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southwestward 2 miles; sinks before reaching Agua Caliente Creek (tributary to San Luis Rey River, which discharges to the Pacific); fall, about 1,100 feet; shown on map as perennial stream. Ramona sheet.

Canada Aguanga Creek; San Diego County; rises in extreme northeastern part of T. 10 S., R. 2 E., San Bernardino base and meridian, at altitude 3,100 feet above sea level; flows southeastward to San Luis Rey River (which discharges to the Pacific) at Puerta Cruz; intermittent; length, about 3 miles; fall, 200 feet. Ramona sheet.

Canada Agua Vina Creek; Santa Barbara County; an intermittent stream, 1 mile long, flowing southwestward to the Pacific in Punta de la Concepcion Rancho. Guadalupe sheet.

Canada Arena; Santa Barbara County; northwestern part of La Laguna Rancho; opens southward to Canada los Coches (tributary to San Antonio Creek). Lompoc sheet.

Canada Chiquita Creek; Orange County; an intermittent stream, about 7 miles long, flowing southward and entering San Juan Creek 4 miles northwest of Capistrano. Corona sheet.

Canada de Aliso Creek; Ventura County; an intermittent stream, 3½ miles long, rising on the south slope of Sulphur Mountain and flowing east of south into Canada Larga (tributary to Ventura River, which discharges to the Pacific). Ventura sheet.

Canada de Cojo Creek; Santa Barbara County; an intermittent stream, 3 miles long, flowing west of south into the Pacific 2½ miles east of Concepcion. Lompoc sheet.

Canada de la Brea Creek; Santa Barbara County; an intermittent stream, 2½ miles long, rising in T. 5 N., R. 33 W., San Bernardino base and meridian, and flowing southeastward toward the Pacific just west of Santa Anita. Lompoc sheet.

Canada del Agua Amarga; Santa Barbara County; northwestern part of La Laguna Rancho; opens southward to Canada de los Coches (tributary to San Antonio Creek). Lompoc sheet.

Canada del Agua Caliente Creek; Santa Barbara County; an intermittent stream, 3 miles long, flowing southward and entering the Pacific 1½ miles west of Port Orford. Lompoc sheet.

Canada de la Laguna; Santa Barbara County; a drainage way extending southward from the Purisima Hills to Santa Ynez River, which discharges to the Pacific. Lompoc sheet.

Canada del Aliso Creek; Coyote Creek basin; Alameda County; an intermittent stream, 3½ miles long, flowing south of west into Arroyo de la Laguna, whose basin is tributary to the tidal marsh north of Coyote River (tributary to San Francisco Bay). Pleasanton sheet.

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Canada de la Posta Creek; Santa Barbara County; an intermittent stream, rising in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, and flowing southward into the Pacific 1½ miles east of Alcatraz. Lompoc sheet.

Canada de la Puente; San Antonio Creek basin; Santa Barbara County; southern part of La Laguna Rancho; opens northward to Arroyo de los Alamos. Lompoc sheet.

Canada de las Cruces Creek; Santa Barbara County; a drainage way extending southward from the east end of the Santa Rosa Hills to Gaviota Creek at Las Cruces. Lompoc sheet.

Canada de las Calaveras; Santa Barbara County; southeastern part of Los Alamos Rancho; extends northward to Los Alamos Valley (drained by San Antonio Creek, which discharges to the Pacific) at the city of Los Alamos. Lompoc sheet.

Canada de las Encinas Creek; Santa Maria River basin; Santa Barbara County; western part of Sisquoc Rancho; an intermittent stream, 2 miles long, flowing southwestward to the valley of Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Canada de las Encinas Creek; Ventura River basin; Ventura County; an intermittent stream, 1 mile long, flowing westward into Ventura River (tributary to the Pacific) 1 mile below the mouth of Canada Larga Creek. Ventura sheet.

Canada de las Flores; Santa Barbara County; western part of Los Alamos Rancho; opens southeastward to Los Alamos Valley (drained by San Antonio Creek, which discharges to the Pacific) near Careaga. Lompoc sheet.

Canada de las Llagas Creek; Santa Barbara County; an intermittent stream, 3 miles long, flowing southward to the Pacific in the central part of Canada del Corral Rancho. Lompoc sheet.

Canada de la Vina; Santa Barbara County; a drainage way in T. 6 N., R. 23 W., San Bernardino base and meridian, extending northwestward from the Santa Rosa Hills to Santa Ynez River, which discharges to the Pacific. Lompoc sheet.

Canada del Capitan Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains, and flowing west of south into the Pacific near Capitan. Lompoc sheet.

Canada del Cierbo Creek; Contra Costa County; an intermittent stream, 2 miles long, rising in the northwestern part of Canada del Hambre and flowing northwestward to the east end of San Pablo Bay. Carquinez sheet.

Canada del Comasa; Santa Barbara County; southeastern part of La Laguna Rancho; opens southwestward to Arroyo de los Alamos (draining to San Antonio Creek, which discharges to the Pacific). Lompoc sheet.

Canada del Corral Creek; Santa Barbara County; an intermittent stream, 3 miles long, rising in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains, and flowing southward to the Pacific west of Capitan. Lompoc sheet.

Canada del Diablo; Ventura County; rises on the south slope of Red Mountain in Canada de San Miguelito Rancho, at altitude 1,750 feet above sea level; flows southeasterly into Ventura River (which discharges to the Pacific) 1½ miles northwest of the city of Ventura; length, 4½ miles; fall, 1,700 feet; intermittent. Ventura sheet.

Canada del Dorindo Creek; Santa Clara County; rises in the northern part of T. 10 S., R. 5 E., Mount Diablo base and meridian; flows southeastward into Pacheco Creek (tributary to Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 7 miles. Land Office map of California, 1907.

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Canada del Gato Creek; Santa Barbara County; an intermittent stream, 2 miles long, flowing southward into the Pacific near Gato station. Lompoc sheet.

Canada del Gato Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 4 miles long, rising on the north slope of the Lompoc Hills, in T. 9 N., R. 32 W., San Bernardino base and meridian, and flowing northwestward and east of north toward the valley of Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Canada del Molino Creek; Santa Barbara County; an intermittent stream rising in the Santa Barbara National Forest, 1½ miles east of Gaviota Peak, and flowing southward into the Pacific; 2 miles long. Lompoc sheet.

Canada de los Alamos Creek; Ventura and Los Angeles counties; rises in the central part of T. 8 N., R. 19 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows southeastward 12 miles to its junction with Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 3,700 feet; intermittent; principal tributary, Maxy Canyon Creek. Tejon sheet.

Canada de los Alisos; Santa Barbara County; receives the drainage of the northeastern part of La Laguna Rancho; extends southwestward from the Solomon Hills toward Arroyo de los Alamos (draining to San Antonio Creek, which discharges to the Pacific). Lompoc sheet.

Canada de los Coches; San Antonio Creek basin; Santa Barbara County; northern part of La Laguna Rancho; opens southward to Arroyo de los Alamos (draining to San Antonio Creek, which discharges to the Pacific); tributaries, Canada del Agua Amarga, and Canada Arena. Lompoc sheet.

Canada de los Coches; Santa Maria River basin; Santa Barbara County; an intermittent stream, 2½ miles long, rising on the southern slope of Los Coches Mountain and flowing southwestward to Cuyama River (Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Canada de los Ladrones Creek; Santa Barbara County; an intermittent stream, 1 mile long, flowing southwestward to the Pacific in Punta de la Concepcion Rancho. Guadalupe sheet.

Canada de los Palos Blancos; Santa Barbara County; a drainage way extending southward from the Purisima Hills to Santa Ynez River, which discharges to the Pacific. Lompoc sheet.

Canada de los Sauces Creek; Santa Barbara County; an intermittent stream, about 1 mile long, flowing southwestward toward the Pacific in Punta de la Concepcion Rancho. Guadalupe sheet.

Canada del Refugio Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 1,500 feet above sea level; flows west of south toward the Pacific Ocean at Orella; length, about 5 miles. Lompoc sheet.

Canada del Rodeo Creek; Santa Barbara County; an intermittent stream, 1 mile long, flowing southwestward to the Pacific in Punta de la Concepcion Rancho. Guadalupe sheet.

Canada de Rodriguez Creek; Ventura County; an intermittent stream, 2½ miles long, rising on the east slope of Red Mountain, at altitude 1,950 feet above sea level; flows southeastward to Ventura River, which discharges to the Pacific; fall, 1,800 feet. Ventura sheet.

Canada de San Joaquin Creek; Ventura County; an intermittent stream. 1½ miles long, flowing westward into Ventura River (which discharges to the Pacific) 2 miles north of the city of Ventura. Ventura sheet.

Canada de Santa Anita Creek; Santa Barbara County: an intermittent stream, about 4 miles long, rising in T. 5 N., R. 33 W., San Bernardino base and

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meridian, and flowing eastward and then southward toward the Pacific at Santa Anita. Lompoc sheet.

Canada de Santa Rosa; Santa Barbara County; southeastern part of Los Alamos Rancho; opens northward to Los Alamos Valley (draining to San Antonio Creek, which discharges to the Pacific), west of the city of Los Alamos. Lompoc sheet.

Canada de Santa Ynez; Santa Barbara County; southwestern part of La Laguna Rancho; opens northward to Arroyo de los Alamos (draining to San Antonio Creek, which discharges to the Pacific). Lompoc sheet.

Canada el Jolloru Creek; Santa Barbara County; an intermittent stream, 2 miles long, flowing southwestward toward the Pacific near Sudden station. Guadalupe sheet.

Canada el Morida Creek; Santa Barbara County; an intermittent stream, 2 miles long, flowing southwestward toward the Pacific one-half mile northwest of Sudden station. Guadalupe sheet.

Canada Gubernadora Creek; Orange County; an intermittent stream, 8 miles long, flowing into San Juan Creek 5 miles northwest of Capistrano. Corona sheet.

Canada Honda Creek; Santa Barbara County; rises on the west slope of the Lompoc Hills, at altitude 1,200 feet above sea level; flows north of west to the point at which it enters the Pacific near Point Pedernales; length, about 8 miles. Guadalupe sheet.

Canada Laguna Seca; Santa Barbara County; southern part of Los Alamos Rancho; opens northward to Los Alamos Valley (draining to San Antonio Creek, which discharges to the Pacific) 2½ miles west of the city of Los Alamos. Lompoc sheet.

Canada Larga Creek; Ventura County; rises in Ex Mission San Buenaventura Rancho at altitude 1,250 feet above sea level; flows northwestward 2 miles, then southwestward 5 miles to its junction with Ventura River (tributary to the Pacific); fall, 1,100 feet; tributaries draining Sulphur, Coche, and Leon canyons, Canada de Aliso and Canada Seca. Santa Paula and Ventura sheets.

Canada Omentero Creek; Santa Barbara County; an intermittent stream, 1½ miles long, rising on the south slope of Gaviota Peak and flowing southward into the Pacific at Alcatraz. Lompoc sheet.

Canada Salada. *See* Oso Creek.

Canada San Onofre Creek; Santa Barbara County; an intermittent stream, 2 miles long, rising on the east slope of Gaviota Peak, in the Santa Barbara National Forest, and flowing southward into the Pacific. Lompoc sheet.

Canada Seca Creek; Ventura County; an intermittent stream, about 1 mile long, flowing northwestward into Canada Larga (tributary to Ventura River, which discharges to the Pacific) opposite and below the mouth of Canada de Aliso Creek. Ventura sheet.

Canada Verde Creek; Coyote River basin; Santa Clara County. *See* San Felipe Creek.

Canada Verde Creek; San Luis Rey River basin; San Diego County; rises in the central part of T. 10 S., R. 4 E., San Bernardino base and meridian, at altitude 5,800 feet above sea level; flows southwestward to the western border of San Jose Del Valle, where it sinks; length, about 5 miles; fall, 2,700 feet. The basin is a part of that drained by Agua Caliente Creek (tributary to San Luis Rey River, which discharges to the Pacific). Shown on the map as a perennial stream. Ramona sheet.

Canada Verde Creek; San Mateo County; a stream about 2 miles long, rising in T. 6 S., R. 5 W., Mount Diablo base and meridian, and flowing westward into the Pacific near Miramontes Point. Santa Cruz sheet.

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Canadian Creek; Klamath River basin; Trinity County; rises in the northern part of T. 4 N., R. 7 E., Humboldt base and meridian; flows northeastward 3 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Canejo Creek; Ventura County; rises in the eastern part of El Canejo Rancho; takes a very irregular but in general southwesterly course to its junction with Calleguas Creek in Rio de Santa Clara Rancho; intermittent; principal tributaries, North Fork and Arroyo Santa Rosa. Camulos and Hueneme sheets.

Canejo Creek, North Fork; Ventura County; rises in the northern part of El Canejo Rancho and flows south of west 4 miles into Arroyo Canejo (tributary to Calleguas Creek, which discharges to the Pacific); intermittent. Camulos sheet.

Cannon Creek; Siskiyou County; rises in a small lake in the north-central part of T. 43 N., R. 12 W., Mount Diablo base and meridian; flows in general northward 2½ miles, northeastward 4 miles, and eastward 3 miles to its junction with Scott River through which it is tributary to Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

Canoe Creek; Humboldt County; rises in the west-central part of T. 2 S., R. 2 E., Humboldt base and meridian; flows in general north of east into South Fork of Eel River (tributary to Eel River and thus to the Pacific); length, about 4 miles. Punnett's map of Humboldt County.

Canon Creek; Humboldt County; rises in the north-central part of T. 5 N., R. 3 E., Humboldt base and meridian; flows northwestward 4 miles, then southwestward 3 miles into Mad River (tributary to the Pacific). Punnett's map of Humboldt County.

Canon Creek; Trinity County; rises in the western part of T. 36 N., R. 10 W., Mount Diablo base and meridian, on the southeast slope of Thompson Peak; takes a general southerly course to the northeastern part of T. 33 N., R. 11 W., where it enters Trinity River (tributary to Klamath River, which discharges to the Pacific); length, about 18 miles; principal tributaries, Bear Creek, Little East Fork of Canon, East Fork, and Gwin Gulch Creek; in the southwestern part of T. 36 N., R. 10 W., passes through two lakes which are connected by a short southward-flowing stream. Punnett's map of Trinity County.

Canon Creek, East Fork; Trinity County; rises in the south-central part of T. 35 N., R. 10 W., Mount Diablo base and meridian; flows westward into Canon Creek (tributary to Trinity River and thus to Klamath River, which discharges to the Pacific); length, 3 miles. Punnett's map of Trinity County.

Canon Creek, Little East Fork; Trinity County; rises in the central part of T. 35 N., R. 11 W., Mount Diablo base and meridian; flows southwestward 2 miles, then westward three-fourths mile into Canon Creek (tributary through Trinity River to Klamath River, which discharges to the Pacific) at Dedrick. Punnett's map of Trinity County.

Canton Canyon Creek; Los Angeles and Ventura counties; rises in the southwestern part of T. 6 N., R. 17 W., San Bernardino base and meridian, 1 mile northeast of Whitaker Peak, at altitude 3,500 feet above sea level; flows in general southwestward to its junction with Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 6 miles; fall, 2,300 feet. Tejon sheet.

Canyon Creek, Big; Ventura River basin; Ventura County; an intermittent stream, 1½ miles long, rising on the north slope of Sulphur Mountain and flowing northeastward into Lion Canyon Creek (tributary through San Antonio Creek to Ventura River) in Upper Ojai Valley. Santa Paula sheet.

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Canyon de los Alisos Creek; San Luis Obispo County; an intermittent stream flowing southwestward into Tar Spring Creek (tributary to Arroyo Grande Creek). Arroyo Grande sheet.

Cape Horn Canyon Creek; Los Angeles County; rises in the southern part of T. 2 N., R. 9 W., San Bernardino base and meridian, at altitude 2,750 feet above sea level; flows northeastward into San Gabriel River (tributary to the Pacific); length, about 1½ miles; fall, 1,150 feet; intermittent. Pomona sheet.

Cape Horn Creek; Siskiyou County; rises in the northern part of T. 47 N., R. 6 W., Mount Diablo base and meridian, at altitude 3,000 feet above sea level; flows southeastward 3 miles into Klamath River (tributary to the Pacific); fall, 900 feet. Shasta sheet.

Caribou Creek; San Bernardino County; southern part of T. 3 N., R. 1 E.; an intermittent stream, about 1 mile long, flowing southwestward into Arrastre Flat, Mohave desert. San Gorgonio sheet.

Caribou Lake; Lassen County; northeastern part of T. 30 N., R. 7 E., Mount Diablo base and meridian; one small inlet; no outlet shown on map but contours indicate that the lake may overflow to Susan Creek; altitude, about 6,000 feet. Called Silver Lake on Starkweather's map of Lassen County. Lassen Peak sheet.

Carmen Lake; Mono County; southwestern part of T. 6 N., R. 23 E., Mount Diablo base and meridian; outlet, an intermittent stream flowing west and north to West Walker River (tributary to Walker River, which discharges to Walker Lake); altitude, about 7,175 feet; fall of outlet, about 400 feet. Bridgeport sheet.

Careaga Canyon; Santa Barbara County; central part of Los Alamos Rancho; opens southward to Los Alamos Valley (draining to San Antonio Creek, which discharges to the Pacific) near Careaga. Lompoc sheet.

Carmelo River; Monterey County; rises in the central part of T. 17 S., R. 4 E., Mount Diablo base and meridian; flows northwestward and enters the Pacific in Carmelo Bay, between Point Cypress and Point Carmelo; length, about 25 miles; principal tributaries, Glicko and Garzos creeks. Land Office map of California, 1907.

Carmelocitos River; Monterey County; rises in the southeastern part of T. 18 S., R. 1 E., Mount Diablo base and meridian; flows northeastward to Glicko Creek (tributary to Carmelo River, which discharges to the Pacific in Carmelo Bay); length, about 10 miles. Land Office map of California, 1907.

Carmel River. *See* Carmelo River.

Carneros Creek; Napa County; rises in the southern part of T. 6 N., R. 5 W., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows southeastward into Napa River (tributary to San Pablo Bay); length, about 9 miles; intermittent. Napa sheet.

Carpenter Canyon; San Luis Obispo County; southern part of Corral de Piedra Rancho; opens southeastward to Corbett Canyon (tributary to Arroyo Grande Creek). Arroyo Grande sheet.

Carpinteria Creek; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains, at altitude 1,500 feet above sea level; flows southeastward 3 miles, then southwestward 3 miles to Carpinteria, where it enters the Pacific; principal tributaries Sutton Canyon and Gobernador creeks. Ventura and Santa Barbara special sheets.

Carrizo Canyon Creek; San Luis Obispo County; an intermittent stream, 6 miles long, rising in the northeastern part of T. 32 S., R. 18 E., Mount Diablo base and meridian, and flowing southward to Cuyama River (Santa Maria River, which discharges to the Pacific); tributary, Saltos Canyon Creek. McKittrick sheet.

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Carrizo Creek; Riverside County; an intermittent stream, about 3 miles long, flowing northward from Dos Palmos Spring toward Dead Indian Creek, which discharges to the Colorado Desert. Indio special map.

Carrizo Creek; San Diego County; rises in the northeastern part of T. 12 S., R. 3 E., San Bernardino base and meridian, in the Santa Ysabel Indian Reservation, at altitude 4,500 feet above sea level; flows northwestward 10 miles to its junction with San Luis Rey River, which discharges to the Pacific; fall, 1,900 feet; intermittent in lower course. Ramona sheet.

Carroll Canyon Creek; San Diego County; rises in the southern part of T. 14 S., R. 2 W., San Bernardino base and meridian, at altitude 800 feet above sea level; flows, in general, somewhat south of west into Soledad Canyon Creek (tributary through Los Penasquitos Canyon Creek to the Pacific); intermittent; length, about 9 miles; fall, 700 feet. La Jolla sheet.

Carroll Creek; Inyo County, Sequoia National Forest; rises on the south slope of Owens Point, at altitude 10,800 feet above sea level; flows north of east 3½ miles, then eastward and southeastward 4½ miles to Owens Lake; fall, 7,200 feet. Mount Whitney and Olancha sheets.

Carson River; Alpine County, Cal., and Douglas County, Nev.; formed in Carson Valley, Nev., by the union of its East and West forks. The East Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises 1 mile west of the west line of T. 6 N., R. 22 E., Mount Diablo base and meridian, at altitude 10,200 feet above sea level; takes an irregular but in general northerly course to a point near Gardnerville, Nev., where it receives West Fork; from this point the course of the river is northward to Empire, Nev., where it turns to the northeast and finally disappears in Carson Sink; length to head of East Fork, including major windings, about 160 miles; length of the East Fork above junction, 52 miles; fall of East Fork above the junction, 5,500 feet; fall of main stream in the 108 miles below the junction, about 900 feet.[1]

Carson Sink, into which the river discharges, lies in Churchill County, Nev., in the northern part of Carson Desert; during the winter and spring it receives a considerable supply of water from both Humboldt and Carson rivers and becomes a shallow, playa lake, 20 to 25 miles long and 14 miles broad. In arid summers the water supply fails and the lake completely evaporates, and as desiccation becomes more intense the salts impregnating the lake beds are brought to the surface and form an efflorescense several inches thick. In October, 1881, the Carson was a broad mud-colored plain covered in places with a white, alkaline crust that looked like patches of snow. In 1908 Carson Sink was mapped by the topographers of the United States Geological Survey as a permanent water body 12 miles long by 12 miles wide, receiving Carson River from the south. The drainage line from Humboldt Lake to the sink was marked as an intermittent river.

The water of the Carson is derived entirely from snowfall and run-off from the mountains. The basin contains no lakes but many ideal reservoir sites are available near the head-waters. These sites have been thoroughly investigated by the United States Reclamation Service and others interested. Several fertile valleys lie along the course of the river and much land is unutilized for lack of water. During the early spring and summer months the river is a raging torrent, but in the late summer the discharge is barely sufficient to supply the irrigation demand. Good power sites are available on both forks of the river.

Gaging stations on East Fork at Silver King Valley (1910–1912) and near Markleeville (1910–1912).

[1] Given as 1,900 feet in Water-Supply Paper U. S. Geol. Survey No. 270.

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Authorities: Dardanelles, Markleeville, Carson, Wabuska, and Carson Sink sheets; Water-Supply Paper U. S. Geol. Survey No. 290, 1912, p. 155; No. 270, 1911, p. 137. See also annual reports of United States Reclamation Service.

Carson River, East Fork. *See* Carson River.

Carson River, West Fork; Alpine County, Cal.; and Douglas County, Nev.; rises in Alpine County on the east slope of the Sierra, near the summit of the divide which separates Carson River waters from those flowing to Mokelumne River; flows somewhat east of north 10 miles, eastward through West Carson Canyon 7 miles, then to the northeast and west of north 15 miles to Carson Valley where it unites with the East Fork to form Carson River (tributary to Carson Sink); fall above junction with East Fork, 3,900 feet, of which 3,600 feet is made in the upper 22 miles. The altitudes in this basin are in general lower than those in the basin of the East Fork. Above West Carson Canyon is Hope Valley which affords good reservoir site; water stored at this point could be used to develop a large amount of power in West Carson Canyon. Gaging station at Woodfords (1900–1912). Markleeville sheet; Water-Supply Paper U. S. Geol. Survey No. 290, 1912, p. 155.

Carson Sink. *See* Carson River.

Carthage Creek; Inyo County; Kern National Forest; rises on the east slope of the Sierra at altitude 9,200 feet above sea level; flows eastward to the edge of Owens Valley, where its waters sink; length, about 6 miles; fall, 5,500 feet. Olancha sheet.

Cascade Creek; Eldorado County. *See* Cascade Lake.

Cascade Creek; Santa Cruz and San Mateo counties; an intermittent stream, 2 miles long flowing southwestward toward the Pacific in Punto del Año Nuevo Rancho; sinks in the sands northeast of Año Nuevo Point. Santa Cruz sheet.

Cascade Lake; Eldorado County; southern part of T. 13 N., R. 17 E., Mount Diablo base and meridian; inflowing stream drains several small lakes; outlet, a stream [Cascade Creek?] half a mile long flowing northeastward to Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); altitude, about 6,450 feet; fall of outlet, 225 feet; the lake is somewhat more than a mile long and about half a mile wide. Pyramid Peak sheet.

Casitas Creek; Ventura County; an intermittent stream, 2½ miles long, rising in the southwestern part of T. 4 N., R. 24 W. at altitude 1,100 feet above sea level, and flowing westerly into Rincon Creek near Shepards; fall, 900 feet. Ventura sheet.

Caspar River; Mendocino County; rises in the southeastern part of T. 18 N., R. 17 W., Mount Diablo base and meridian; flows southwestward 3 miles, then west and northwest 3 miles to the point at which it enters the Pacific near the town of Caspar. Punnett's map of Mendocino County.

Castac Creek; Los Angeles County; rises in the northern part of T. 7 N., R. 17 W., San Bernardino base and meridian, on the south slope of the Liebre Mountains; flows southeasterly to the head of Castac Valley, then south and west of south to its junction with Santa Clara River 1½ miles southwest of Castac; the crest of the Liebre Mountains, from which the headwater streams flow, is nearly 5,800 feet above sea level; the elevation at the mouth of the stream is about 1,000 feet above sea level; the creek traverses Castac Valley in a broad, sandy wash and delivers water to Santa Clara River (tributary to the Pacific) only during floods; the principal tributary is the stream from Elizabeth Lake Canyon. Tejon and Santa Susana sheets.

Castle Canyon; Ventura County; Santa Barbara National Forest; northwestern part of T. 7 N., R. 23 W., San Bernardino base and meridian; opens westward to Cuyama River (Santa Maria River, which discharges to the Pacific). Mount Pinos sheet.

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Castro Canyon Creek; Santa Barbara County; an intermittent stream. 6 miles long, rising in the southeastern part of T. 9 N., R. 26 W., San Bernardino base and meridian, and flowing northward toward Cuyama River (Santa Maria River, which discharges to the Pacific) in Cuyama Valley. Santa Ynez sheet.

Castro Creek; Contra Costa County; a channel in the tidal marsh on the south shore of San Pablo Bay. San Francisco sheet.

Cat Creek; Riverside County; southeastern part of T. 5 S., R. 5 E., San Bernardino base and meridian; an intermittent stream whose flood waters discharge to Dead Indian Creek in the Colorado Desert. Indio special sheet.

Cathedral Canyon; Riverside County; northern part of T. 5 S., R. 5 E., San Bernardino base and meridian; an intermittent stream discharging to Tahquitz Creek, which is tributary through Whitewater River to the Colorado Desert. Indio special sheet.

Cattle Creek; San Gabriel River basin; Los Angeles County: rises in the northwestern part of T. 2 N., R. 7 W., San Bernardino base and meridian, on the southwestern slope of San Antonio Peak, at altitude 8,600 feet above sea level; flows southwestward 5 miles, then westerly 3 miles into San Gabriel River (tributary to the Pacific); fall, 6,700 feet; principal tributaries, Cow Creek and Coldwater Canyon Creek. San Antonio, Cucamonga, and Pomona sheets.

Cattle Creek; Walker Lake basin; Mono County; rises in the central part of T. 3 N., R. 24 E., Mount Diablo base and meridian, on the north slope of Twin Peaks, at altitude 11,100 feet above sea level; flows northeastward 1 mile, then west of north 3 miles into Twin Lakes (outlet, Robinson Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); fall, about 4,000 feet. Bridgeport sheet.

Cayetano Creek; Contra Costa and Alameda counties; rises in Contra Costa County, in the northwestern part of T. 2 S., R. 2 E., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows southward to its junction with Arroyo las Positas (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay); length, about 7 miles; fall, 800 feet; intermittent; called Arroyo Cavelano on the Mount Diablo sheet. Mount Diablo and Pleasanton sheets.

Cayucos Creek; San Luis Obispo County; rises in the Santa Lucia Mountains, in the southern part of T. 27 S., R. 10 E., Mount Diablo base and meridian; flows southward to Cayucos, on Estero Bay, where it enters the Pacific; length, about 7 miles. Cayucos sheet.

Cayucos Creek, Little; San Luis Obispo County; rises in the central part of T. 28 S., R. 10 E., Mount Diablo base and meridian, at altitude 500 feet above sea level; flows west of south 2½ miles to Cayucos, on Estero Bay, where it enters the Pacific. Cayucos sheet.

Cebada Canyon; Santa Barbara County; a drainage way extending southward through the Purisima Hills toward the valley of Santa Ynez River (tributary to the Pacific) northeast of Mission La Purisima. Lompoc sheet.

Cecil Creek; Siskiyou County; rises in the northwestern part of T. 37 N., R. 11 W., Mount Diablo base and meridian, on the north slope of New River Mountains; flows somewhat east of north to its junction with Salmon River (tributary to Klamath River which flows to the Pacific); length, 3 miles. Punnett's map of Siskiyou County.

Cedar Canyon Creek; Otay River basin; San Diego County; rises in the eastern part of T. 18 S., R. 1 E., San Bernardino base and meridian, on the north slope of Otay Mountain, at altitude 3,000 feet above sea level; flows northward 3 miles, then northwestward 1½ miles; sinks before reaching Dulzura Creek (tributary through Jamul Creek to lower Otay reservoir); fall, 2,300 feet; intermittent. Cuyamaca sheet.

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Cedar Creek; Eel River basin; Mendocino County; rises in the south-central part of T. 24 N., R. 16 W., Mount Diablo base and meridian; takes a general southwesterly course to its junction with South Fork of Eel River (tributary to Eel River, which discharges to the Pacific); length, about 8 miles; several small tributaries draining the southern slopes of Red Mountain. Punnett's map of Mendocino County.

Cedar Creek; Klamath River basin; Trinity County; rises in the northeastern part of T. 37 N., R. 7 W., Mount Diablo base and meridian, at altitude 3,800 feet above sea level; flows southeastward to its junction with East Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 4 miles; fall, about 1,500 feet. Shasta sheet.

Cedar Creek; Mohave River basin; San Bernardino County; rises in the eastern part of T. 2 N., R. 3 W., San Bernardino base and meridian, on the north slope of Heaps Peak, at altitude 6,000 feet above sea level; flows northeast and north into Shake Creek (tributary to Deep Creek, which discharges to Mohave River); length, 1½ miles; fall, 950 feet. Redlands and Deep Creek sheets.

Cedar Creek; San Diego River basin; San Diego County; rises in central part of T. 13 S., R. 4 E., San Bernardino base and meridian, at altitude 4,700 feet above sea level; flows westward and southwestward to its junction with San Diego River (tributary to the Pacific through False Bay); length, about 12 miles; fall, 3,700 feet; principal tributaries, Dehr and Sandy creeks. Ramona and Cuyamaca sheets.

Cedar Creek, Big; Ventura County; an intermittent stream, about 1 mile long, rising in the northern part of T. 6 N., R. 19 W., San Bernardino base and meridian, and flowing northwestward to Snowy Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Centennial Creek; Ventura County; an intermittent stream rising in the southwestern part of T. 5 N., R. 19 W., San Bernardino base and meridian, and flowing southward into Fourfork Creek (tributary through Little Sespe Creek to Sespe Creek and thus to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Centinelia Creek; Los Angeles County; rises near Centinelia; flows northwestward about 4 miles to Mesmer, then southwestward 3 miles to Ballona Lagoon. Redondo sheet.

Cerrito Creek; Alameda County; an intermittent stream, 1½ miles long, flowing westward toward San Francisco Bay along the boundary between Contra Costa and Alameda counties. San Francisco sheet.

Chabot, Lake; Alameda County; east of the city of San Leandro; principal inlet, San Leandro Creek, which flows through the lake and discharges through San Leandro Bay into San Francisco Bay; receives also Grass Creek; dammed at outlet; altitude, 235 feet. Haywards sheet.

Chabot, Lake; Solano County; 2 miles northeast of Vallejo; inlet, Sulphur Springs Creek; outlet, a stream 1½ miles long flowing westward to Napa River. Napa sheet.

Chalona Creek; San Benito and Monterey counties; rises in the southern part of T. 16 S., R. 6 E., Mount Diablo base and meridian; flows eastward about 8 miles, then southeastward, southward and southwestward to Metz, where it joins Salinas River, which discharges to the Pacific in Monterey Bay; length, about 22 miles; principal tributary, a stream rising about 3 miles south of San Benito, flowing southwestward, and joining the creek 3 miles northeast of Metz. Land Office map of California, 1907.

Chariot Canyon Creek; Salton Sink basin; San Diego County; an intermittent stream draining the eastern part of T. 13 S., R. 4 E., and flowing

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northwestward to Banner Canyon Creek, through which it discharges to San Felipe Valley; length, about 4 miles. Ramona sheet.

Charlie Canyon Creek; Los Angeles County; an intermittent stream, 7 miles long, rising in the southeastern part of T. 6 N., R. 16 W., San Bernardino base and meridian, on the south slope of Red Mountain, and flowing southwestward to Castac Creek (tributary to Santa Clara River, which discharges to the Pacific) in Castac Valley; fall, 1,900 feet; principal tributary, Bitter Creek. Tejon and Santa Susana sheets.

Cheeseboro Canyon Creek; Ventura and Los Angeles counties; an intermittent stream, 5 miles long, flowing in general southerly to Posita Canyon Creek, which is tributary through Medea Creek to Triunfo Creek and thus through Malibu Creek to the Pacific. Camulos sheet.

Chemise Creek; Mendocino, Humboldt, and Trinity counties; rises in Mendocino County in the northeastern part of T. 24 N., R. 16 W., Mount Diablo base and meridian; flows northeastward and unites with Eel River (tributary to the Pacific) in Trinity County, in the southwestern part of T. 4 S., R. 6 E., Humboldt base and meridian; length, about 10 miles. Punnett's maps of Mendocino, Humboldt, and Trinity counties.

Cheney Creek; Lassen County; rises in the southwestern part of T. 29 N., R. 11 E., Mount Diablo base and meridian, at altitude 5,100 feet above sea level; flows northward into Susan River (tributary to Honey Lake); length, about 4 miles; fall, 700 feet. Honey Lake sheet.

Cherry Creek; Klamath River basin; Klamath County, Oreg.; rises in the western part of the county; flows southeastward and eastward into Sevenmile Creek (tributary through Upper Klamath Lake to Klamath River, which discharges to the Pacific); length, 10 miles; connected with Sevenmile Creek by two channels. Ashland sheet.

Cherry Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 45 N., R. 8 W., Mount Diablo base and meridian, on the north slope of Forest Mountain; flows in general westward 3 miles, then west of south 7 miles to its junction with Moffitt Creek (tributary through Scott River to Klamath River, which flows to the Pacific); principal tributary, Deadwood Creek. Punnett's map of Siskiyou County. On Land Office map of California, 1907, Cherry Creek is called McAdams Creek.

Cherry Creek; Santa Clara River basin; Ventura County; rises in the southwestern part of T. 6 N., R. 23 W., San Bernardino base and meridian, on Ortega Hill (altitude, 4,970 feet); flows northward into Sepse Creek (tributary to Santa Clara River, which discharges to the Pacific); length, 2½ miles; intermittent. Mount Pinos sheet.

Chihuahua Creek; San Diego County; a westward flowing stream draining portions of Tps. 8 and 9 S., Rs. 2 and 3 E., San Bernardino base and meridian, and discharging into Oak Grove Valley, which is drained by Temecula Creek to Santa Margarita River; altitudes in this basin range from 2,800 feet in the valley to 5,500 feet at the summit of the range. Ramona sheet.

Chileno Canyon Creek; Los Angeles County; rises in the northwestern part of T. 2 N., R. 10 W., San Bernardino base and meridian, at altitude 4,250 feet above sea level; flows southerly 3 miles into West Fork of San Gabriel River (tributary through San Gabriel River to the Pacific); fall, 2,000 feet. Rock Creek and Pomona sheets.

Chiles Creek; Napa County; rises in the southern part of T. 8 N., R. 4 W.; Mount Diablo base and meridian; flows southeastward into Sage Canyon Creek (tributary through Napa River to San Pablo Bay); length, about 1 mile. Napa sheet.

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China Dry Lake; Kern and San Barnardino counties; Tps. 25 and 26 S., Rs. 40 and 41 E., Mount Diablo base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, Pl. I, p. 42.

Chino Canyon Creek; Riverside County; T. 4 S., Rs. 3 and 4 E., San Bernardino base and meridian; flows northeastward about 3 miles toward the Colorado. San Jacinto sheet.

Chino Creek; San Bernardino County; rises opposite the opening of San Antonio Canyon; skirts along the extreme southwestern edge of the alluvial deposit of the Cucamonga Plain; is joined by several little spring streams of similar character and by Rincon Mill Creek near its mouth, and joins the Santa Ana (tributary to the Pacific) about half a mile above its canyon through the Coast Range. The creek represents the up-risings at lower points on the Cucamonga Plain of waters that have sunk at the canyon openings along its high northern edge 10 to 15 miles away. Cucamonga and Corona sheets; Irrigation in [southern] California, Sacramento, 1888, p. 126.

Chocolate Creek; San Diego County; rises in the southern part of T. 15 S., R. 2 E., San Bernardino base and meridian, at altitude 1,800 feet above sea level; flows northwestward 3 miles, then east of north 3 miles into San Diego River, which discharges to the Pacific through False Bay; intermittent; fall, 1,100 feet. Cuyamaca sheet.

Chokecherry Creek; Santa Barbara County; rises in the Santa Barbara National Forest, 2 miles northeast of Big Pine Mountain, at altitude 5,500 feet above sea level; flows northeastward into Santa Barbara Canyon Creek (tributary to Cuyama River—Santa Maria River—which discharges to the Pacific); length, 3 miles; fall, 1,700 feet. Santa Ynez sheet.

Cholame Creek; San Luis Obispo County; rises in the southern part of T. 22 S., R. 13 E., Mount Diablo base and meridian, 3 miles southwest of Stone Canyon; flows southeastward 12 miles, then southwestward 6 miles to Shandon, where it unites with San Juan Creek to form Estrella Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); no tributaries named on the map. Land Office map of California, 1907.

Chorro Creek; San Luis Obispo County; rises in the southern part of T. 29 S., R. 12 E., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows west of south about 3 miles, northwestward 7 miles, then to the west and south into Morro Bay, through which it enters the Pacific; principal tributaries, Pennington, San Luisito, and San Bernardo creeks. San Luis Obispo and Cayucos sheets.

Cienaga Canyon Creek; Los Angeles County; an intermittent stream, about 2 miles long, flowing southwestward from the Liebre Mountains to Castac Creek (tributary to Santa Clara River, which discharges to the Pacific) near its head. Tejon sheet.

Cienega Creek; San Benito County; rises in the southeastern part of T. 12 S., R. 7 E., Mount Diablo base and meridian; flows west of south 12 miles, then northwestward 2 miles into Tequisquito Slough (tributary through Pacheco Creek to Pajaro River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

Cienaga Seca Creek; San Bernardino County; rises 2 miles east of the east line of T. 1 N., R. 2 E., San Bernardino base and meridian, at altitude 8,700 feet above sea level; flows northwestward 3 miles, then southwestward 2½ miles, and discharges into Big Meadows near the head of Santa Ana River (tributary to the Pacific); fall, 1,700 feet. San Gorgonio sheet.

Cincas Creek; Santa Clara County; a stream about 5 miles long, joining Guadalupe River (tributary to San Francisco Bay) from the east in the city of San Jose. San Jose sheet.

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City Creek; San Bernardino County; rises in the southern part of T. 2 N., R. 3 W., San Bernardino base and meridian, at altitude 5,650 feet above sea level; flows irregularly southward and southwestward into Santa Ana Wash. The basin comprises about 24 square miles and is exceedingly precipitous, for the creek falls about 4,000 feet in 8 miles; the basin is only 2 miles wide in its lower portion, but about halfway up the East Fork joins the main stream and above the fork the basin is fan-shaped. Precipitation is heavy in the upper part of the basin, the creek is subject to great and sudden floods, and its waters annually run through and join the Santa Ana in a surface current. During the flood of 1861–62 the creek cut a new channel parallel with and about 2 miles from Santa Ana River lengthwise through the valley, and joined Warm Creek on the eastern edge of the town of San Bernardino. Redlands sheet; Irrigation in California, by Wm. Ham. Hall, Sacramento, 1888, p. 122.

City Creek, East Fork; San Bernardino County; rises in the southwestern part of T. 2 N., R. 2 W., San Bernardino base and meridian, at altitude 6,150 feet above sea level; flows southwestward about 5 miles to its junction with City Creek (tributary to Santa Ana River); fall, 4,100 feet. Redlands sheet.

Clank Hollow Creek; Solano County; a short intermittent stream rising in the Montezuma Hills and flowing westward toward Montezuma Slough in the tidal marsh on the north side of Suisun Bay. Antioch sheet.

Claremont Creek; Temescal Creek basin; Alameda County; rises in the Berkeley Hills; flows southwestward 2½ miles into Temescal Creek, which discharges to San Francisco Bay. Concord and San Francisco sheets.

Clark Canyon Creek; Mono County; rises in the northeastern part of T. 4 N., R. 25 E., Mount Diablo base and meridian, in Warm Spring Flat, at altitude about 7,400 feet above sea level; flows northwestward 3½ miles into Aurora Canyon Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); fall, 700 feet. Bridgeport sheet.

Clark Lake; San Diego County; Tps. 9 and 10 S., Rs. 6 and 7 E.; an intermittent water body occupying a depression 542 feet above sea level. Indio special sheet.

Clark Valley Creek, San Luis Obispo County; See Los Osos Creek.

Clarks Creek; Siskiyou County; rises in the eastern part of T. 41 N., R. 10 W., Mount Diablo base and meridian; flows northeastward 6 miles to its junction with Scott River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Clear Creek; Klamath River basin; Klamath County, Oreg.; rises in the southwestern part of the county; flows eastward 6 miles, then southeastward 10 miles into Klamath River (tributary to the Pacific). Ashland sheet.

Clear Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 17 N., R. 5 E., Humboldt base and meridian, on the east slope of Siskiyou Mountains; flows southwestward 3 miles, southeastward 4 miles, then somewhat south of east 12 miles to its junction wth Klamath River (tributary to the Pacific) in the northwestern part of T. 15 N., R. 7 E.; principal tributaries, Middle Fork, Deep Creek, North Fork, Bowlder Creek, and South Fork. Punnett's map of Siskiyou County.

Clear Creek; Pajaro River basin; San Benito County; rises in the northwestern part of T. 18 S., R. 12 E., Mount Diablo base and meridian, on the west slope of San Benito Peak; flows southwestward into San Benito River (Pajaro River, which discharges to the Pacific); length, about 5 miles. Land Office map of California, 1907.

Clear Creek; San Gregorio Creek basin; San Mateo County; an intermittent stream, 3 miles long, rising in San Gregorio Rancho and flowing west of south

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into San Gregorio Creek (which discharges to the Pacific), 2 miles east of San Gregorio; fall, about 700 feet. Santa Cruz sheet.

Clear Creek; San Lorenzo River basin; Santa Cruz County; a stream about 2 miles long, rising on the east slope of Ben Lomond Mountain, in T. 9 S., R. 3 W., Mount Diablo base and meridian, and flowing easterly into San Lorenzo River (tributary to the Pacific) 1 mile below the mouth of Bowlder Creek. Santa Cruz sheet.

Clear Creek, Middle Fork; Siskiyou County; rises in the southern part of T. 17 N., R. 5 E., Humboldt base and meridian, on the east slope of Preston Peak; flows southwestward 7 miles to its junction with Clear Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Clear Creek, North Fork; Siskiyou County; rises in the southeastern part of T. 17 N., R. 5 E., Humboldt base and meridian, on the east slope of Preston Peak; flows in general southeastward to its junction with Clear Creek (tributary to Klamath River, which flows to the Pacific); length, about 9 miles. Punnett's map of Siskiyou County.

Clear Creek, South Fork; Siskiyou County; rises in the eastern part of T. 15 N., R. 5 E., Humboldt base and meridian; flows in general somewhat north of east to its junction with Clear Creek (tributary to Klamath River, which flows to the Pacific); length, 8 miles. Punnett's map of Siskiyou County.

Clear Lake; Modoc County; outlet, Lost River, which discharges to Rhett Lake; a portion of the flood discharge of Willow Creek passes to Clear Lake, but at the same time a large portion of the Willow Creek water passes down Lost River. When the creek falls Clear Lake begins draining into Lost River, discharging through its intake channel. The area of Clear Lake, according to the Land Office surveys, is 9,200 acres; the area of the adjacent swamp is 15,000 acres; the basin above the lake is covered by a sparse growth of pines; the elevation of lake surface is 4,533 feet. Modoc Lava bed sheet; Water-Supply Paper U. S. Geol. Survey No. 146, 1905, p. 98.

Clearwater Creek; Mono County; rises in the northern part of T. 4 N., R. 26 E., Mount Diablo base and meridian, on the south slope of Potato Peak, at altitude 9,700 feet above sea level; takes an irregular, but in general southwesterly course to Mormon Meadow, whence its course is northwestward to Virginia Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); length, about 12 miles; fall, 2,800 feet; intermittent through upper course. Bridgeport sheet.

Coahuila Creek; Riverside County; Santa Margarita River basin; a southwestward flowing stream draining parts of T. 7 S., Rs. 2 and 1 E., San Bernardino base and meridian; the stream is about 4 miles long and flows toward Wilson Creek (tributary to Temecula Creek, Santa Margarita River, which discharges to the Pacific), but connection between the channels is not clearly shown on the maps. San Jacinto and Ramona sheets.

Coal Canyon Creek; Los Angeles County; an intermittent stream, 2½ miles long, rising in the east-central part of T. 1 S., R. 17 W., San Bernardino base and meridian, and flowing southward into Pacific Ocean. Calabasas sheet.

Coche Canyon Creek; Ventura River basin; Ventura County; an intermittent stream, 2½ miles long, rising on the south slope of Sulphur Mountain and flowing east of south into Canada Larga (tributary to Ventura River, which discharges to the Pacific). Santa Paula and Ventura sheets.

Coffee Creek; Trinity County; rises in the northeastern part of T. 38 N., R. 10 W., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows southeastward to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 16 miles; fall, 4,100

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feet, of which 1,500 feet is made in the first 2 miles; principal tributaries, Union Creek, North and East forks of Coffee Creek, Sugarpine, Boulder, and Little Boulder creeks. Gaging station at Coffee (1910–1912). Shasta sheet; Punnett's map of Trinity County.

Coffee Creek, East Fork; Trinity County; rises in the central part of T. 38 N., R. 8 W., Mount Diablo base and meridian, on the west slope of Billy's Peak; flows north of west 2 miles, then west and southwest about 3 miles to its junction with Coffee Creek (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Coffee Creek, North Fork; Trinity County; rises in the central part of T. 39 N., R. 9 W., Mount Diablo base and meridian, at altitude 6,400 feet above sea level; flows in general southeastward to its junction with Coffee Creek (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 6 miles; fall, 3,600 feet. Shasta sheet.

Coja Creek; Santa Cruz County; a stream about 4 miles long, rising in the northern part of Refugio Rancho and flowing in general southwestward into the Pacific 1 mile north of Table Rock. Santa Cruz sheet.

Cold Creek; Eel River basin; Glenn and Mendocino counties; rises in Glenn County in the northeastern part of T. 21 N., R. 9 W., Mount Diablo base and meridian; flows westward into the South Fork of Middle Fork of Eel River (tributary through Middle Fork of Eel River to Eel River, which discharges to the Pacific); length, about 7 miles. Punnett's map of Mendocino County.

Cold Creek; Eel River basin; Lake County; rises in the south-central part of T. 19 N., R. 8 W., Mount Diablo base and meridian; flows westward into Eel River (tributary to the Pacific); length, 5 miles. Punnett's map of Lake and Mendocino counties.

Cold Creek; Malibu Creek basin; Los Angeles County; rises in the central part of T. 1 S., R. 17 W., San Bernardino base and meridian; winds circuitously westward into Malibu Creek (tributary to the Pacific); length, about 4 miles. Camulos sheet.

Cold Creek; Russian River basin; Mendocino County; rises on the west slope of the Coast Range in the southeastern part of T. 16 N., R. 11 W., Mount Diablo base and meridian; flows northwestward 7 miles to its junction with East Fork of Russian River (tributary through Russian River to the Pacific). Punnett's map of Mendocino County.

Cold Creek; Santa Ana River basin; San Bernardino County; an intermittent stream, about 1 mile long, flowing northward toward Santa Ana River (which discharges to the Pacific) in the central part of T. 1 N., R. 1 W., San Bernardino base and meridian; fall, about 1,700 feet. San Gorgonio sheet.

Cold Creek; Truckee River basin; Placer County; rises in the northern part of T. 16 N., R. 15 E., Mount Diablo base and meridian, at altitude about 8,500 feet above sea level; flows northeastward into Donner Creek (tributary to Truckee River, which discharges to Pyramid and Winnemucca lakes); length, 6 miles; fall, about 2,500 feet. Truckee sheet.

Cold Spring Canyon Creek; San Juan Creek basin; Orange County; an intermittent stream, about 4 miles long, flowing southward and entering San Juan Creek near San Juan Hot Springs; fall, 1,800 feet. Corona sheet.

Cold Spring Canyon Creek; San Mateo Creek basin; San Diego County; rises on the northern slope of the Santa Margarita Mountains, at altitude 2,000 feet above sea level; flows southwestward 2 miles into Devil Canyon Creek (tributary to San Mateo Creek, which discharges into the Pacific); fall, 1,300 feet; intermittent. San Luis Rey sheet.

Cold Spring Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at

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altitude 2,750 feet above sea level; flows east of south 5 miles and enters the Pacific near Miramar; intermittent below mouth of canyon; tributaries, East and West forks and Hot Spring Canyon Creek. Santa Barbara special sheet.

Cold Spring Canyon Creek, East Fork; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 2,400 feet above sea level; flows west of south into Cold Spring Canyon Creek, which discharges to the Pacific; length, 1½ miles; fall, 1,500 feet. Santa Barbara special sheet.

Cold Spring Canyon Creek, West Fork; Santa Barbara County; an intermittent stream, 1 mile long, flowing southeastward into Cold Spring Canyon Creek, which discharges to the Pacific. Santa Barbara special sheet.

Coldwater Canyon; Ventura County; a drainage way in the northern part of T. 4 N., R. 20 W., San Bernardino base and meridian, opening northward to Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Coldwater Canyon Creek; Ballona Creek basin; Los Angeles County; an intermittent stream, 3 or 4 miles long, draining a small area in the Santa Monica Mountains, and flowing southward and southeastward into Rodeo de las Aguas Rancho. Near the mouth of its canyon it receives streams draining Franklin and Higgins canyons. Santa Monica sheet.

Coldwater Canyon Creek; Los Angeles River basin; Los Angeles County; rises on the northeast slope of Strawberry Peak, at altitude 5,000 feet above sea level; flows west of north 1½ miles into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); fall, 2,100 feet. Tujunga sheet.

Coldwater Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the northwestern part of T. 2 N., R. 7 W., San Bernardino base and meridian, 1 mile west of San Antonio Peak, at altitude 8,750 feet above sea level; takes a general southwesterly course to its junction with Cattle Creek (tributary to San Gabriel River, which discharges to the Pacific); length, about 6½ miles; fall, 6,100 feet. San Antonio and Cucamonga sheets.

Coldwater Canyon Creek; Santa Ana River basin; San Bernardino County; rises in northeastern part of T. 2 N., R. 7 W., San Bernardino base and meridian, at altitude 6,750 feet above sea level; flows northeastward 3 miles into North Fork of Lytle Creek (tributary through Lytle Creek to Santa Ana River, which discharges to the Pacific); fall, 1,650 feet. San Antonio sheet.

Coldwater Canyon Creek; Santa Ana River basin; Riverside County; rises on the north slope of Santiago Peak at altitude 4,500 feet above sea level; flows northeastward into the valley of Temescal Creek (tributary to Santa Ana River, which discharges to the Pacific) at Hot Sulphur Springs. Corona and Elsinore sheets.

Coldwater Fork; Santa Clara River basin; Ventura County; rises in the eastern part of T. 6 N., R. 20 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows southwestward into Hot Springs Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific); length, 4 miles; fall, 3,500 feet. Tejon sheet.

Coleman Creek; San Diego County; rises in the northern part of T. 13 S., R. 4 E., San Bernardino base and meridian, at altitude 4,300 feet above sea level; flows northwestward to its junction with San Diego River (tributary to the Pacific); length, about 6 miles; fall, 1,200 feet. Ramona sheet.

Colemans Creek; Sonoma County; rises in the southern part of T. 7 N., R. 10 W., Mount Diablo base and meridian, near Camp Meeker; takes a general course south of west to its junction with Salmon Creek (tributary to the Pacific); length, 6 miles. Punnett's map of Sonoma County.

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Collier Canyon Creek; Contra Costa and Alameda counties; an intermittent stream, 4½ miles long, rising in the northeastern part of T. 2 S., R. 1 E., Mount Diablo base and meridian, and flowing east of south to Arroyo las Positas (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay) near the eastern end of Livermore Valley; fall, about 500 feet. Mount Diablo and Pleasanton sheets.

Collins Creek; Siskiyou County; rises in the northwestern part of T. 45 N., R. 9 W., Mount Diablo base and meridian; flows northwestward into Klamath River (tributary to the Pacific); length, about 5 miles. Punnett's map of Siskiyou County.

Colorado Creek; Santa Clara County; rises in the southwestern part of T. 5 S., R. 5 E., Mount Diablo base and meridian; flows in general northwestward to its junction with Arroyo del Valle (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay) in the northeastern part of T. 5 S., R. 3 E.; length, about 12 miles. Mount Hamilton sheet. Called Bayo Creek, North Fork, on Land Office map of California, 1907.

Colorado River; formed in the southeastern part of Utah by the junction of Grand and Green rivers. From this junction it flows in general southwestward, passes across the northwestern corner of Arizona, then turns to the south and for the remainder of its course forms a part of the southeastern boundary of Nevada and California and the western boundary of Arizona. It discharges into the Gulf of California about 60 miles below Yuma. The river receives few tributaries from California.

The Imperial Canal diverts water from the Colorado at a point about 10 miles by river below Yuma to irrigate land in the Imperial Valley.[1]

Gaging stations at Yuma, Ariz. (1891–1912); near Mohave, Ariz. (1902–3); at Hardyville, Ariz. (1905–1907).

Authority: Water-Supply Paper U. S. Geol. Survey No. 300, pp. 33–34.

Colson Fork; Santa Barbara County; an intermittent stream, 3½ miles long, rising in the San Rafael Mountains, in the northeastern part of T. 10 N., R. 32 W., San Bernardino base and meridian, and flowing southwestward into Tepusquet Creek (tributary through Sisquoc River to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Colt Canyon Creek; San Luis Obispo County; rises in the northwestern part of T. 29 S., R. 14 E., Mount Diablo base and meridian; flows westward into Salinas River, which discharges to the Pacific in Monterey Bay; about 4 miles long. Land Office map of California, 1907.

Compton Creek; Los Angeles County; rises west of Los Angeles River, about 4 miles west of Downey; flows southwestward into Wilmington Lagoon. Downey sheet.

Conejos Creek; San Diego County; rises in eastern part of T. 14 S., R. 3 E., San Bernardino base and meridian, on the west slope of Cuyamaca Peak at altitude 4,500 feet; flows westward 2 miles, then southwestward 4 miles into South Fork of San Diego River (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; fall, 2,800 feet. Cuyamaca sheet.

Conley Creek; Humboldt County; rises in the eastern part of T. 2 S., R. 5 E., Humboldt base and meridian; flows southwestward 4 miles, then southward 2 miles into Dobbin Creek (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Conn Creek; Napa County; rises in Rancho La Jota; takes a general southeasterly course and, in times of flood, unites with Napa River (tributary to

[1] See also Salton Sink, pp. 178–179.

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San Pablo Bay); length, about 13 miles; principal tributaries Sage Canyon and Rector Canyon creeks; intermittent. Napa sheet; Punnett's map of Napa County.

Coolgardie Dry Lake; San Bernardino County; T. 13 S., Rs. 46 and 47 E., Mount Diablo base and meridian. Water-Supply Paper U. S. Geol Survey No. 224, Pl. I, and p. 58.

Coon Canyon Creek; San Luis Obispo County; rises in T. 31 S., R. 11 E., Mount Diablo base and meridian, in the San Luis Range, at altitude 1,200 feet above sea level; flows somewhat north of west to Pecho y Islay Rancho, where it enters the Pacific. Port Harford and Cayucos sheets.

Coon Creek; Eel River basin; Del Norte County; rises in the northwestern part of T. 16 N., R. 3 E., Humboldt base and meridian; flows northwestward 1 mile, then in general southwestward 8 miles to its junction with South Fork of Smith River (tributary to Smith River, which flows to the Pacific). Punnett's map of Del Norte County.

Coon Creek; Santa Ana River basin; San Bernardino County; rises one-half mile east of the east line of T. 1 N., R. 2 E., San Bernardino base and meridian, at altitude 8,000 feet above sea level; flows north of west 4 miles and discharges into Big Meadows near the head of Santa Ana River (tributary to the Pacific); fall, 800 feet; intermittent. San Gorgonio sheet.

Cooskie Creek; Humboldt County; rises in the western part of T. 3 S., R. 2 W., Humboldt base and meridian; flows northwestward, westward, and southwestward to the point at which it enters the Pacific; length 4 miles. Punnett's map of Humboldt County.

Copeland Creek; Sonoma County; rises in the eastern part of Cotati Rancho; flows north of west 5 miles to its junction with Robert Crane Creek (tributary through Laguna de Santa Rosa to Santa Rosa Creek, Russian River, and the Pacific). Punnett's map of Sonoma County.

Coppell Creek; Humboldt County; rises in the eastern part of T. 11 N., R. 3 E., Humboldt base and meridian; flows southwest and south to its junction with Klamath River (tributary to the Pacific); length, 4 miles. Punnett's map of Trinity County.

Copper Creek; Trinity County; rises in the central part of T. 37 N., R. 7 W., Mount Diablo base and meridian, at altitude 4,000 feet above sea level; flows in general south of west to its junction with Trinity River (tributary through Klamath River to the Pacific); length, 3 miles; fall, 1,600 feet. Shasta sheet.

Copper Rock Canyon Creek; Lake County; rises in the north-central part of T. 18 N., R. 8 W., Mount Diablo base and meridian, on the west slope of Mount St. John; flows somewhat south of west to its junction with Eel River (tributary to the Pacific); length, about 6 miles. Punnett's map of Lake and Mendocino counties.

Corbett Canyon; San Luis Obispo County; southern part of Corral de Piedra Rancho; opens southwestward to Arroyo Grande Valley at Arroyo Grande. This canyon is followed by the Pacific Coast Railroad. Arroyo Grande sheet.

Cordelia Slough; Solano County; in the marsh on the north side of Suisun Bay; winds southward from the mouth of Green Creek near Cordelia to Suisun Creek Slough. Napa sheet.

Cordilleras Creek; San Mateo County; an intermittent stream rising in Pulgas Rancho and flowing northeastward to the tidal marsh at the southern end of San Francisco Bay. Santa Cruz sheet.

Cordonices Creek; Alameda County; an intermittent stream, about 2 miles long, flowing westward to the tidal marsh on the east shore of San Francisco Bay, just north of Berkeley. San Francisco sheet.

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Corkscrew Creek; a channel in the tidal marsh in the southern end of San Francisco Bay between Steinberger and Redwood creeks. Haywards sheet.

Corral Canyon Creek; Los Angeles County; an intermittent stream, about 3 miles long, rising on the southern slope of Santa Monica Mountains in T. 1 S., R. 18 W., San Bernardino base and meridian, and flowing southward into the Pacific Ocean. Camulos sheet.

Corral Canyon Creek; Santa Maria River basin; Ventura County; an intermittent stream, 4 miles long, rising in the Santa Barbara National Forest, in the southwestern part of T. 8 N., R. 23 W., San Bernardino base and meridian, and flowing southwestward into Cuyama River (Santa Maria River, which discharges to the Pacific). Mount Pinos sheet.

Corral de Piedra Creek; San Luis Obispo County; formed near Asphalt Mines, in Corral de Piedra Rancho, by the union of the East and West forks. East Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises on the western slope of the Santa Lucia Mountains, in Corral de Piedra Rancho, and flows southwesterly to the point of junction with the West Fork; below the forks the creek flows southward to Pismo Creek, which discharges to the Pacific; length below the forks, about one-half mile; length to head of East Fork, 6 miles; principal tributary of East Fork, Villa Creek. Arroyo Grande sheet.

Corral de Piedra Creek, West Fork; San Luis Obispo County; rises on the western slope of the Santa Lucia Range, west of Piney ridge, at altitude 2,250 feet above sea level; flows southwestward about 6½ miles to Asphalt Mines, where it unites with East Fork to form Corral de Piedra Creek (tributary to Pismo Creek, which discharges to the Pacific); fall, about 2,000 feet. San Luis Obispo and Arroyo Grande sheets.

Corralillas Creek; Santa Barbara County; an intermittent stream, rising in the southern part of Guadalupe Rancho, north of Mount Lospe; flows northwestward, westward, and eastward into Santa Maria Valley (drained by Santa Maria River, which discharges to the Pacific) 2 miles northwest of Guadalupe Lake. Guadalupe sheet.

Corte de Madero Creek; San Mateo County; a stream about 3 miles long, rising in El Corte de Madero Rancho, and flowing northwestward into Searsville Lake, which discharges through San Francisquito Creek to San Francisco Bay. Santa Cruz and Palo Alto sheets.

Corte Madera Creek; Marin County; rises near the western boundary of Canada de Herrera Rancho; flows southeastward into San Francisco Bay, which it enters just above San Quentin. Tamalpais sheet; Punnett's map of Marin County.

Cotteneva Creek; Mendocino County; rises in the southeastern part of T. 23 N., R. 18 W., Mount Diablo base and meridian; flows southwestward 2 miles, east of south about 3 miles, then turns abruptly and flows southwestward one-half mile into the Pacific at Rockport Landing; principal tributary, South Fork, Punnett's map of Mendocino County.

Cotteneva Creek, South Fork; Mendocino County; rises in the western part of T. 22 N., R. 17 W., Mount Diablo base and meridian; flows southwestward about 2½ miles to Rockport, where it joins Cotteneva Creek, through which it is tributary to the Pacific. Punnett's map of Mendocino County.

Cottontail Creek; San Luis Obispo County; rises in T. 28 S., R. 10 E., Mount Diablo base and meridian, at altitude about 500 feet above sea level; flows southeastward 3 miles into Old Creek, which discharges to the Pacific through Estero Bay. Cayucos sheet.

Cottonwood Canyon Creek; Carson Sink basin; Alpine County; rises about 4 miles northeast of Markleeville, at altitude 7,400 feet above sea level; flows

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northeastward 2 miles, then northwestward 2 miles into East Fork of Carson River (tributary through Carson River to Carson Sink); fall, 2,200 feet; intermittent. Markleeville sheet.

Cottonwood Canyon Creek; Mono Lake basin; Mono County; rises in the central part of T. 4 N., R. 27 E., Mount Diablo base and meridian, 1 mile south of Bodie, at altitude 8,400 feet above sea level; flows southward 6 miles; sinks before reaching Mono Lake to which its basin is tributary; fall, about 1,800 feet. Bridgeport sheet.

Cottonwood Canyon Creek; San Jacinto River basin; Riverside County; an intermittent stream, 3 miles long, flowing northwestward to the south end of Railroad Canyon—the old gorge through which the waters of the San Jacinto River occasionally flow to Elsinore Lake. *See* San Jacinto River. Elsinore sheet.

Cottonwood Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 8 miles long, rising in the southwestern part of T. 10 N., R. 28 W., San Bernardino base and meridian, and flowing northward to Cuyama River (Santa Maria River, which discharges to the Pacific). Santa Ynez and McKittrick sheets.

Cottonwood Creek; Alameda Creek basin; Contra Costa and Alameda counties; an intermittent stream, 5 miles long, rising in the eastern part of T. 2 S., R. 1 E., Mount Diablo base and meridian, at altitude 900 feet above sea level; flows in general southward to Arroyo las Positas (tributary through Arroyo de la Laguna to Alameda Creek, which discharges into San Francisco Bay); fall, about 500 feet; flows through Doolan Canyon. Mount Diablo and Pleasanton sheets.

Cottonwood Creek; Alkali Lake basin; Modoc County; rises on the east slope of Warner Mountains, 3 miles northeast of Warren Peak, at altitude 6,000 feet above sea level; flows north of east 5 miles into Middle Alkali Lake; fall, 1,300 feet. Alturas sheet.

Cottonwood Creek; Antelope Valley basin; Kern County; rises on the north slope of Tehachapi Mountains in T. 10 N., R. 16 W., San Bernardino base and meridian, at altitude about 6,000 feet above sea level; flows east and southeast into Antelope Valley; the most important stream flowing into Antelope Valley from the Tehachapi Range. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 13 and Pl. VI; Tejon sheet.

Cottonwood Creek; Klamath River basin; Jackson County, Oreg., and Siskiyou County, Cal.; rises in the central part of T. 40 S., R. 1 E., Willamette meridian, on the eastern slope of Siskiyou Peak, at altitude 5,400 feet above sea level; flows southeastward 14 miles to its junction with Klamath River (tributary to the Pacific) in Siskiyou County, Cal., in the southern part of T. 47 N., R. 6 W., Mount Diablo base and meridian; fall, 3,300 feet; principal tributaries, Hudson and Sheller creeks. Ashland and Shasta sheets.

Cottonwood Creek; Klamath River basin; Siskiyou County; rises in the east-central part of T. 46 N., R. 2 E., Mount Diablo base and meridian; flows northwestward 9 miles, then northeastward 4 miles into Lower Klamath Lake; fall, about 200 feet, of which 100 feet is made in the first 2 miles; called Willow Creek in upper stretch. Modoc Lava Bed sheet.

Cottonwood Creek; Klamath River basin; Siskiyou County; rises in the central part of T. 48 N., R. 7 W., Mount Diablo base and meridian; flows southeastward 10 miles into Klamath River (tributary to the Pacific) near Klamathon; principal tributaries, West Branch and Rocky Gulch Creek. Punnett's map of Siskiyou County.

Cottonwood Creek; Owens Lake basin; Inyo County; Sequoia National Forest; rises on the east slope of the Sierra 1 mile southeast of Mount Langley,

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at altitude 11,500 feet above sea level; flows southeastward into Owens Lake; length, about 16 miles; fall, 7,900 feet; principal tributary, Little Cottonwood Creek and an unnamed stream entering from the right in the lower end of Horseshoe Meadow; passes through Cottonwood Lakes. Gaging station near Olancha (1906–1911). Mount Whitney and Olancha sheets.

Cottonwood Creek; Walker Lake basin; Mono County; rises in the southwestern part of T. 7 N., R. 24 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level; flows southwestward 2 miles, then northwestward 4½ miles to its junction with Deep Creek (tributary through West Walker River to Walker River, which discharges to Walker Lake); fall, 3,200 feet. Bridgeport sheet.

Cottonwood Creek; Santa Margarita River basin; San Diego County; eastern part of T. 9 S., R. 1 E., San Bernardino base and meridian; a northward-flowing stream rising on the northern slope of Palomar Mountain (altitude 6,126 feet) and discharging into the south side of Aguanga Valley. The stream is about 5 miles long, in which distance it falls 3,500 feet. Ramona sheet.

Cottonwood Creek; Tia Juana River basin; San Diego County; rises in the eastern part of T. 16 S., R. 4 E., San Bernardino base and meridian, east of Long Valley Peak, in the Laguna Mountains of the Coast Range, at altitude about 4,500 feet above sea level; flows south and west about 20 miles to the central part of T. 17 S., R. 3 E., where it is joined by Pine Valley Creek; it then takes a general southwesterly course to its junction with Tia Juana River at the Mexican boundary about 22 miles east of the coast line; total drainage area above junction with Tia Juana River, approximately 340 square miles; intermittent. Water is diverted from Pine Valley and Cottonwood creeks by way of Dulzura canal and the headwaters of Dulzura Creek to the lower Otay reservoir, which supplies water to the city of San Diego. Gaging station near Jamul (1905–1912). Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 23; Cuyamaca sheet.

Cottonwood Creek, West Branch; Klamath River basin; Siskiyou County; rises in the northwestern part of T. 47 N., R. 7 W., Mount Diablo base and meridian; flows somewhat north of east 5 miles to its junction with Cottonwood Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Cottonwood Creek, Little; Antelope Valley basin; Kern and Los Angeles counties; rises in the Tehachapi Mountains at altitude 4,200 feet above sea level; flows southeastward 5 miles and then winds northeast and east and enters the west end of Antelope Valley; fed by copious springs which are particularly numerous at the southwestern end of the Tehachapi Range near the foot of the steep slopes. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 13 and Pl. VI; Tejon sheet, on which it is shown but not named.

Cottonwood Creek, Little; Owens Lake basin; Inyo County; rises in the northeastern part of T. 17 S., R. 35 E., Mount Diablo base and meridian, at altitude 10,400 feet above sea level; flows southeastward 3½ miles into Cottonwood Creek (tributary to Owens Lake); fall, 3,000 feet. Olancha sheet.

Cottonwood Lakes; Inyo County; Sequoia National Forest; a group of small lakes southeast of Mount Langley at the head of Cottonwood Creek (tributary to Owens Lake); the highest of the lakes is about 11,150 feet above sea level. Mount Whitney and Olancha sheets.

Cow Canyon Creek; Los Angeles County; rises in the eastern part of T. 2 N., R. 8 W., San Bernardino base and meridian, at altitude 5,500 feet above sea level; flows west of south 1 mile, then north of west 2½ miles into Cattle Creek (tributary to San Gabriel River, which discharges to the Pacific); fall, 2,750 feet. Cucamonga sheet.

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Cow Head Lake; Modoc County; northeastern part; inlets, Eightmile Creek and smaller unnamed streams; altitude, about 5,500 feet above sea level; as shown on the Alturas sheet the lake is about 3 miles long and 2 miles wide.

Cox Creek; San Bernardino County; rises in the western part of T. 3 N., R. 1 W., San Bernardino base and meridian, at altitude 7,300 feet above sea level; takes a circuitous but in general southwesterly course to its junction with Holcomb Creek (tributary to Deep Creek, which discharges to Mohave River); fall, 2,150 feet. Deep Creek sheet.

Coyote Canyon Creek; Los Angeles County; an intermittent stream, 1 mile long, rising in the northeastern part of T. 3 N., R. 15 W., and flowing northward to Sand Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific). Fernando sheet.

Coyote Creek; Marin County; rises in Sausalito Township, at altitude 175 feet above sea level; flows eastward 2 miles into the western arm of Richardson Bay, through which it passes to San Francisco Bay, Golden Gate, and the Pacific. Tamalpais sheet.

Coyote Creek; Owens Lake basin; Inyo County; rises in the southwestern part of T. 8 S., R. 32 E., Mount Diablo base and meridian, at altitude 10,250 feet above sea level; flows somewhat east of north 5 miles, then northwestward 4 miles to its junction with Bishop Creek, which discharges to Owens Valley; fall, 4,750 feet; principal tributary, West Fork. Bishop and Mount Goddard sheets.

Coyote Creek; Riverside County; an intermittent stream, about 3 miles long, flowing northerly to the valley of Deep Canyon Creek (tributary to the Colorado Desert) near the mouth of the canyon. Indio special sheet.

Coyote Creek; Riverside and San Diego counties; rises in the central part of T. 8 S., R. 4 E., flows southeastward and discharges into Borego Valley; intermittent; length above the mouth of canyon, 10 miles, in which distance it falls about 2,500 feet. Ramona and Indio special sheets.

Coyote Creek; San Gabriel River basin; Los Angeles and Orange counties; an intermittent stream rising in the southern part of La Puente Rancho, at altitude 1,000 feet above sea level; flows southwesterly into the valley of San Gabriel River (tributary to the Pacific) in Los Coyotes Rancho; fall in the 2 miles above the mouth of the canyon, about 600 feet. Anaheim and Downey sheets.

Coyote Creek, Santa Clara County. *See* Coyote River, Middle Fork.

Coyote Creek; Ventura River basin; Ventura County; rises in the southwestern part of T. 5 N., R. 24 W., San Bernardino base and meridian, on the south slope of the Santa Ynez Mountains, at altitude 4,250 feet above sea level; flows southeastward to its junction with Ventura River (tributary to the Pacific); length, 13 miles; principal tributaries, East and West forks, Willow, Santa Ana, and Ayers creeks. Ventura sheet.

Coyote Creek, East Fork; Ventura River basin; Ventura County; an intermittent stream, 2 miles long, rising in the northeastern part of T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing southerly into Coyote Creek (tributary to Ventura River, which discharges to the Pacific). Ventura sheet.

Coyote Creek, West Fork; Owens Lake basin; Inyo County; rises in the southeastern part of T. 8 S., R. 31 E., Mount Diablo base and meridian, on the east slope of Coyote Range, at altitude 11,200 feet above sea level; flows northeastward 4 miles to its junction with Coyote Creek (tributary to Bishop Creek, which discharges to Owens Valley); fall, 2,000 feet. Bishop and Mount Goddard sheets.

Coyote Creek, West Fork; Ventura River basin; Ventura County; an intermittent stream, 2½ miles long, rising on the south slope of La Granada Moun-

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tain, in T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing northeastward to Coyote Creek (tributary to Ventura River, which discharges to the Pacific). Ventura sheet.

Coyote Hill Creek; Alameda County; a channel extending along the northern edge of the tidal marsh at the southeastern end of San Francisco Bay, in Potrero de los Cerritos Rancho. Haywards sheet.

Coyote Dry Lake; San Bernardina County; Tps. 11 and 12 N., R. 2 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, pp. 59–60.

Coyote River; Santa Clara County; rises in the southeastern part of T. 7 S., R. 4 E., Mount Diablo base and meridian; flows southward 16 miles to a point south of Gilroy Hot Springs, where it turns abruptly and flows westward and northwestward to the tidal marsh through which it enters San Francisco Bay, and in which it forms the boundary between Alameda and Santa Clara counties; including its major windings, the river is about 65 miles long; principal tributaries, Middle Fork, San Felipe, Silver, Dry, and Penitencia creeks. Mount Hamilton and San Jose sheets; Land Office map of California, 1907.

Coyote River, Middle Fork; Santa Clara County; rises in the western part of T. 8 S., R. 4 E., Mount Diablo base and meridian, on the south slope of Pine Ridge, at altitude about 3,000 feet above sea level; takes an irregular but in general southeasterly course to the northeastern part of T. 9 S., R. 4 E., where it unites with Coyote River (tributary to San Francisco Bay). Mount Hamilton sheet, on which a small area is shown, and Land Office map of California, 1907, on which it is called Coyote Creek.

Cozy Dell Canyon Creek; Ventura County; an intermittent stream, 3 miles long, rising in the eastern part of T. 5 N., R. 23 W., San Bernardino base and meridian, at altitude 3,750 feet above sea level; flows southwestward to the upper end of Ojai Valley (drained by Ventura River, which discharges to the Pacific); fall, 3,000 feet. Ventura sheet.

Crab Creek; San Bernardino County; rises in the central part of T. 2 N., R. 2 W., San Bernardino base and meridian, at altitude 5,750 feet above sea level; flows south of west 1½ miles into Deep Creek (tributary to Mohave River); fall, 750 feet; intermittent. Deep Creek sheet.

Craig Creek; Del Norte County; rises in the southeastern part of T. 17 N., R. 2 E., Humboldt base and meridian; flows southwestward 4 miles, then to the northwest, west, and again to the southwest to its junction with South Fork of Smith River (tributary to Smith River, which flows to the Pacific); length, including major windings, 10 miles. Punnett's map of Del Norte County.

Crapo Creek; Siskiyou County; rises in the southern part of T. 41 N., R. 12 W., Mount Diablo base and meridian; flows southwestward to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific) 1½ miles below Forks of Salmon; length, 12 miles. Punnett's map of Siskiyou County.

Crawford Creek; Siskiyou County; rises in the northern part of T. 38 N., R. 11 W., Mount Diablo base and meridian; flows in general southwestward to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific); length, about 5 miles. Punnett's map of Siskiyou County.

Cristianitos Canyon Creek; Orange and San Diego counties; rises in Mission Viejo, at altitude 800 feet above sea level; flows somewhat west of south 7 miles into Arroyo San Mateo; fall, 700 feet; principal tributaries, streams from Gabino and Talega canyons. Capistrano sheet.

Cronese Dry Lake; San Bernardino County; T. 12 N., R. 6 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, p. 61.

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Crooked River; Klamath County, Oreg.; rises 4 miles south of Fort Klamath; flows southward into Anna River (tributary through Upper Klamath Lake to Klamath River, which discharges to the Pacific); length, 4 miles; tributary, Spring Creek. Klamath sheet.

Cross Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; connects Nurse Slough with Montezuma Slough. Antioch sheet.

Crow Creek; Klamath River basin; Trinity County: rises in the northeastern part of T. 38 N., R. 6 W., Mount Diablo base and meridian; flows southward into East Fork of Trinity River (tributary through Trinity River to Klamath River, which flows to the Pacific); length, about 4 miles. Punnett's map of Trinity County.

Crow Creek; San Lorenzo Creek basin; Alameda County; rises in the western part of T. 2 S., R. 1 W., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows northwesterly 1 mile, then southwesterly 5½ miles to its junction with Cull Creek (tributary through San Lorenzo Creek to San Francisco Bay); fall, 750 feet; tributary, Bolinas Creek. Concord and Haywards sheets.

Crowbar Canyon; San Luis Obispo County; Pecho y Islay Rancho; a short canyon opening southwestward toward the Pacific. Port Harford sheet.

Crystal Creek; Mohave River basin; San Bernardino County; T. 3 N., R. 1 W., San Bernardino base and meridian; an intermittent stream, about 3 miles long, flowing northeastward into the Mohave Desert. San Gorgonio sheet.

Crystal Creek; Santa Ana River basin; San Bernardino County; rises in the southwestern part of T. 1 N., R. 1 W., San Bernardino base and meridian, at altitude 3,900 feet above sea level; flows northwestward 2 miles into Santa Ana River (tributary to the Pacific); fall, 1,050 feet. Redlands sheet.

Crystal Lake; Mono Lake basin; Mono County; southwestern part of T. 2 N., R. 25 E., Mount Diablo base and meridian; one of several small lakes through which Lake Canyon Creek flows to its junction with Mill Creek (tributary to Mono Lake); altitude, about 9,500 feet above sea level. Mount Lyell and Bridgeport sheets.

Crystal Lake; San Gabriel River basin; Los Angeles County; southwestern part of T. 3 N., R. 9 W., San Bernardino base and meridian, on the west edge of Pine Flat, 2 miles south of Mount Islip; intermittent. No outlet shown on the map but a trail leads from the lake to a stream draining into the North Fork of San Gabriel River (tributary through West Fork to San Gabriel River, which discharges to the Pacific); altitude, about 5,600 feet. Rock Creek sheet.

Crystal Springs Lake; San Mateo Creek basin; San Mateo County; lies in a structural depression west of Buriburi and Pulgas ridges and east of Sawyer and Cahil ridges; inlets, many small intermittent streams and San Mateo Creek, which flows through the lake to San Francisco Bay; divided into an upper and lower lake by a dam. The lake is about 5 miles long from the northwest end of the upper lake to the southeast end of the lower lake, and about one-quarter mile in average width. San Mateo and San Jose sheets.

Cuarta Canyon Creek; Santa Barbara County; an intermittent stream, 2 miles long, flowing southward and entering the Pacific at Sacate. Lompoc sheet.

Cuaslui Creek; Santa Barbara County; a short, intermittent stream, rising in the Solomon Hills in the southeastern part of Tinaquaic Rancho, and flowing southwestward to Canada de los Alisos, which drains through Arroyo de los Alamos to San Antonio Creek, which discharges to the Pacific. Lompoc sheet.

Cucamonga Canyon Creek; San Bernardino County; Santa Ana River basin; rises in the southeastern part of T. 2 N., R. 7 W., San Bernardino base and

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meridian, on the south slope of Cucamonga Peak, at altitude 8,000 feet above sea level; takes a general southwesterly course to San Bernardino Valley. The creek has built a large delta of gravel and sand at the mouth of its canyon. Cucamonga sheet.

Cull Creek; Contra Costa and Alameda counties; rises in the southeastern part of T. 1 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,650 feet above sea level; flows generally southward to San Lorenzo, where it unites with Palomeras Creek to form San Lorenzo Creek (tributary to San Francisco Bay); length, about 8 miles; fall, 1,450 feet; principal tributary, Crow Creek. Concord and Haywards sheets.

Curly Cow Creek; Mendocino County; rises in the southeastern part of T. 20 N., R. 15 W., Mount Diablo base and meridian; flows southeastward through Sherwood Valley to Sherwood, then east and north of east to its junction with Deep Creek (tributary to Eel River, which discharges to the Pacific); length, 5 miles. Punnett's map of Mendocino County.

Cutoff Slough; Solano County; in the tidal marsh on the north side of Suisun Bay, between Montezuma and Suisun Creek sloughs. Antioch and Carquinez sheets.

Cuyamaca Reservoir; San Diego County; in the Coast Range about 70 miles east of San Diego, at altitude of 4,800 feet above sea level. The water is turned from the reservoir into Boulder Creek, down which it flows for 12½ miles with a fall of 4,000 feet to the main diverting weir of the San Diego flume, the altitude of which is 800 feet. The storage capacity of the reservoir is 11,500 acre-feet; surface area, about 1,000 acres. The catchment basin above the reservoir is only 11 square miles in area but the average annual precipitation is about 45 inches—nearly sufficient in ordinary years to fill the reservoir. Cuyamaca sheet, Thirteenth Ann. Rept. U. S. Geol. Survey, 1893, pp. 287–288. *See also* Reservoirs for irrigation, water power, and domestic water supply, by J. D. Schuyler, second edition, 1908, pp. 423–429.

Cuyama River. *See* Santa Maria River.

Daggett Creek; Siskiyou County; rises in the central part of T. 47 N., R. 9 W., Mount Diablo base and meridian; flows in general somewhat east of south to its junction with Klamath River (tributary to the Pacific); length, 4 miles. Punnett's map of Siskiyou County.

Dale Dry Lake; San Bernardino County; T. 1 N., R. 12 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Dalton Canyon, Big; San Gabriel River basin; Los Angeles County; carries an intermittent stream draining the northern and central part of T. 1 N., R. 9 W., San Bernardino base and meridian; fed by streams in Volfe, Bell, Monroe, Pine, Lewis Paul, and Little Dalton canyons. The basin is nearly oval in form, about 4½ miles long from the opening back to the crest of the main ridge, about 3 miles wide, and comprises between 9 and 10 square miles. In some years the surface flow dries up altogether for several miles up the canyon. The wash of the Dalton is fairly broad and pronounced for a mile or more below the canyon, but striking against a long narrow hill in the plain it is deflected to the west much diminished in size, fails to join the San Dimas Wash (tributary to San Gabriel River, which discharges to the Pacific), and pursues a parallel course with one-half mile space between the two, and finally becomes lost in the lower plains.

Authorities: Pomona sheet; Hall, Wm. Ham: Irrigation in California (Southern), Part II of Report of State Engineer of California on Irrigation and the irrigation question, Sacramento, 1888, p. 377.

Dalton Canyon Creek, Little; Los Angeles County; rises in the northern part of T. 1 N., R. 9 W., San Bernardino base and meridian, at altitude 3,000 feet

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above sea level; flows in general west of south about 4½ miles to its junction with Big Dalton Canyon (tributary to San Gabriel River, which discharges to the Pacific); fall, about 1,900 feet. Pomona sheet.

Danby Dry Lake; San Bernardino County; Tps. 1 and 2 N., Rs. 17 and 18 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Dan Creek, Big; Mendocino County; rises in the northwestern part of T. 23 N., R. 16 W., Mount Diablo base and meridian; flows northwestward 1½ miles, then southwestward 1½ miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Darwin Creek; Inyo County; Inyo National Forest; rises on the southeastern slope of Mount Darwin at altitude 12,500 feet above sea level; flows north of east 2 miles into Middle Fork of Bishop Creek (tributary through Bishop Creek to Owens River, which discharges to Owens Lake); fall, 1,500 feet. Mount Goddard sheet.

Davenport Creek; San Luis Obispo County; rises in San Luis Valley southeast of Islay Hill, in the northwestern part of Corral de Piedra Rancho, at altitude 350 feet above sea level; flows irregularly westward into San Luis Obispo Creek (which discharges to the Pacific) 3½ miles southwest of the city of San Luis Obispo; length, about 5 miles; fall, about 300 feet. Arroyo Grande sheet.

Davis Canyon Creek; San Luis Obispo Creek basin; San Luis Obispo County; rises in the San Luis Range, in T. 31 S., R. 11 E., Mount Diablo base and meridian, at altitude 850 feet above sea level; flows southeastward 3 miles into See Canyon, through which it is tributary to San Luis Obispo Creek, which discharges to the Pacific; fall, about 600 feet. Port Harford and San Luis Obispo sheets.

Davis Creek; Humboldt County; rises in the northern part of T. 1 S., R. 2 W., Humboldt base and meridian; flows south of west to the point at which it enters the Pacific, about 4 miles southeast of Cape Mendocino. Punnett's map of Mendocino County.

Davy Brown Canyon Creek; Santa Barbara County; an intermittent stream, 4 miles long, rising in the Santa Barbara National Forest 3 miles west of Cachuma Mountain and flowing northerly to Manzana Creek (tributary through Sisquoc River to Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Dawson Canyon Creek; Riverside County; an intermittent stream, 4 miles long, flowing westward into Temescal Wash (tributary to Santa Ana River, which discharges to the Pacific) 1½ miles northeast of Temescal. Elsinore sheet.

Day Canyon Creek; Santa Ana River basin; San Bernardino County; an intermittent stream, 2½ miles long, rising in southwestern part of T. 2 N., R. 6 W., San Bernardino base and meridian, and flowing west of south into San Bernardino Valley. Cucamonga sheet.

Deadhorse Creek; Ventura County; rises in the southern part of T. 7 N., R. 19 W., San Bernardino base and meridian, on the eastern slope of Snowy Peak, at altitude 5,300 feet above sea level; flows northward into Snowy Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Dead Indian Creek; Riverside County; a drainage way opening into the Colorado Desert in the southwestern part of T. 5 S., R. 6 E., San Bernardino base and meridian; this channel receives the flood waters from Ramon, Cat, Ebbens, Grapevine, and Carrizo creeks. Indio special sheet.

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Deadman Canyon Creek; Santa Clara River basin; Los Angeles County; carries the drainage from the southern part of T. 5 N., R. 15 W., and the northwestern part of T. 4 N., R. 15 W., southwestward into Santa Clara River (tributary to the Pacific), to which it delivers water only in times of flood; Texas, Plum, Haskell Canyon, and Dry Canyon creeks are the principal tributaries. Fernando and Santa Susana sheets.

Deadman Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 4 miles long, rising in the central part of T. 10 N., R. 28 W., San Bernardino base and meridian, and flowing east of north into Schoolhouse Canyon Creek (tributary to Cuyama River—Santa Maria River—which discharges to the Pacific). Santa Ynez sheet.

Deadman Canyon Creek. *See* San Jose Creek.

Deadman Creek; Antelope Valley basin; Los Angeles County; rises in the southwestern part of T. 5 N., R. 8 W., San Bernardino base and meridian; flows northward to Antelope Valley; length, about 10 miles. Land Office map of California, 1907.

Deadman Creek; Owens River basin; Mono County; rises in northern part of T. 3 S., R. 26 E., Mount Diablo base and meridian, on the east slope of San Joaquin Mountain (altitude 11,584 feet); flows southeastward 3 miles, then northeastward to its junction with Owens River. Mount Lyell sheet; shown but not named on Land Office map of California. 1907.

Deadwood Creek; Klamath River basin; Siskiyou County; rises in the western part of T. 45 N., R. 8 W., Mount Diablo base and meridian, on the east slope of Old Baldy Mountain; flows in general south of east 3 miles to its junction with Cherry Creek (tributary through Moffitt Creek to Scott River and thus through Klamath River to the Pacific). Punnett's map of Siskiyou County.

Deadwood Creek; Klamath River basin; Trinity County; rises in the northeastern part of T. 33 N., R. 8 W., Mount Diablo base and meridian, on the west slope of Trinity Mountains, at altitude 4,000 feet above sea level; flows somewhat south of west to its junction with Trinity River (tributary through Klamath River to the Pacific); length, 4 miles; fall, 2,200 feet. Red Bluff sheet.

Dean Canyon Creek; Humboldt County; rises in the east-central part of T. 4 S., R. 4 E., Humboldt base and meridian; flows northwestward 6 miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Death Valley Sink. *See* Amargosa River.

Decker Canyon Creek; Riverside County; an intermittent stream, about 3 miles long, rising on the western slope of Elsinore Mountains in T. 6 S., R. 5 W., San Bernardino base and meridian, and flowing southwesterly into San Juan Creek. Elsinore sheet.

Deep Canyon Creek; Riverside County; Cleveland National Forest; an intermittent stream rising on the north slope of the Santa Rosa Mountains, at Virgin Springs, and flowing east of north to the Colorado Desert; length above mouth of canyon, about 10 miles, in which distance the fall is 6,200 feet. Indio special sheet.

Deep Creek; Eel River basin; Mendocino County; rises in the east-central part of T. 17 N., R. 13 W., Mount Diablo base and meridian; flows northwestward about 19 miles, then northeastward 7 miles to its junction with Eel River (tributary to the Pacific); principal tributaries, Willits, Outlet, Curly Cow, and Long Valley creeks. Punnett's map of Mendocino County.

Deep Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 17 N., R. 5 E., Humboldt base and meridian; flows southward 6

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miles to its junction with Clear Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Deep Creek; Klamath River basin; Trinity County; rises in the northeastern part of T. 35 N., R. 9 W., Mount Diablo base and meridian, on the west slope of Granite Peak; flows north of west 2½ miles, then west and south 3 miles to its junction with Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Deep Creek; Mohave River basin; San Bernardino County; formed in the southern part of T. 2 N., R. 2 W., San Bernardino base and meridian, at altitude 6,150 feet above sea level, by the union of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the southwestern part of T. 2 N., R. 1 W., and flows south of west. Below these forks the creek flows in general northwestward to its junction with Mohave River near the entrance of the West Fork; length to the head of the North Fork, including major windings, about 22 miles; principal tributaries, Green Valley, Little Bear, and Holcomb creeks. Redlands and Deep Creek sheets.

Deep Creek; Santa Ana River basin; San Bernardino County; rises in the northern part of T. 1 S., R. 2 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows southwestward into Santa Ana River, which discharges to the Pacific; length, 1½ miles; fall, 1,350 feet; intermittent. Redlands sheet.

Deep Creek; Truckee River basin; Placer County; rises in the northeastern part of T. 16 N., R. 15 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows north of east 4 miles to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes); fall, 2,300 feet. Truckee sheet.

Deep Creek; Walker Lake basin; Mono County; rises in the southern part of T. 7 N., R. 24 E., Mount Diablo base and meridian, on the west slope of the Sweetwater Mountains, at altitude 10,700 feet above sea level; flows northwestward 8 miles to its junction with West Walker River (tributary to Walker River, which discharges to Walker Lake); fall, 4,700 feet; principal tributary, Cottonwood Creek. Water is diverted from this creek at a point about 3 miles above the head to Lobdel Lake in Swamp Meadows at the head of Desert Creek. Bridgeport sheet.

Deep Creek, South Fork; San Bernardino County; rises in the northeastern part of T. 1 N., R. 2 W., San Bernardino base and meridian, between Keller and Slide peaks, at altitude 7,600 feet above sea level; flows northwestward to its junction with the North Fork with which it forms Deep Creek (tributary to Mohave River); length, 2 miles; fall, 1,450 feet. Redlands sheet.

Deer Canyon; Arroyo Grande Creek basin; San Luis Obispo County; southern part of Corral de Piedra Rancho; opens southeastward to Corbett Canyon. Arroyo Grande sheet.

Deer Canyon Creek; Santa Ana River basin; San Bernardino County; rises in the southeastern part of T. 2 N., R. 7 W., San Bernardino base and meridian, on the south slope of Cucamonga Peak, at altitude 8,100 feet above sea level; flows east of south about 3½ miles into San Bernardino Valley; intermittent; the most important of the smaller group of canyons lying between Lytle and San Antonio canyons. Cucamonga sheet.

Deer Canyon Creek; Ventura County; an intermittent stream, 2 miles long, rising in the central part of T. 1 S., R. 20 W., San Bernardino base and meridian, and flowing southwestward into the Pacific. Camulos sheet.

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Deer Creek; Klamath River basin; Trinity County; formed in the western part of T. 36 N., R. 9 W., Mount Diablo base and meridian, by two forks, one a stream about 4 miles long coming from the northwest, and the other a stream 3 miles long entering from the southeast; below the forks Deer Creek flows southwestward 2 miles to its junction with Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Deer Creek; Mad River basin; Humboldt County; rises in the northeastern part of T. 3 N., R. 4 E., Humboldt base and meridian; flows east of south 2 miles, then southwestward 2 miles into Mad River (tributary to the Pacific). Punnett's map of Humboldt County.

Deer Creek; San Lorenzo River basin; Santa Cruz County; rises in the south-central part of T. 8 S., R. 2 W., Mount Diablo base and meridian, on the west slope of Castle Rock Ridge, at altitude 2,700 feet above sea level; flows southwestward into Bear Creek (tributary to San Lorenzo River, which discharges to the Pacific); length, about 4 miles; fall, 1,900 feet. Santa Cruz sheet.

Deer Creek; Santa Ana River basin; San Bernardino County; rises in the northern part of T. 1 N., R. 1 W., San Bernardino base and meridian, one-half mile south of Lookout Point, at altitude 6,200 feet above sea level; flows southwestward into Santa Ana River (tributary to the Pacific); length, about 3 miles; fall, 2,450 feet. San Gorgonio and Redlands sheets.

Deer Creek; Truckee River basin; Placer County; rises in the eastern part of T. 16 N., R. 16 E., Mount Diablo base and meridian, on the south slope of Mount Pluto, at altitude 8,000 feet above sea level; flows south of west 3½ miles into Truckee River (tributary to Pyramid and Winnemucca lakes); fall, about 1,900 feet. Truckee sheet.

Dehr Creek; San Diego County; rises in eastern part of T. 13 S., R. 3 E., San Bernardino base and meridian, at altitude 3,900 feet above sea level; flows southwestward 2 miles into Cedar Creek (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; fall, 700 feet. Ramona sheet.

Delta Canyon Creek; Los Angeles County; an intermittent stream, about 2 miles long, flowing northwestward into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific) opposite and below the mouth of Trail Canyon Creek. Fernando sheet.

Deluz Creek; Riverside and San Diego counties; rises in Santa Rosa Mountains; flows southwestward into Santa Margarita River (tributary to the Pacific) at Deluz Station; about 13 miles long; perennial for some miles of its course. Elsinore and San Luis Rey sheets.

Deming Creek; Klamath County, Oreg.; rises in the eastern part of the county; flows southwestward into South Fork of Sprague River (tributary through Sprague River to Williamson River and thus through Upper Klamath Lake to Klamath River, which discharges to the Pacific). Klamath sheet.

Denniston Creek; San Mateo County; rises in the southwestern part of T. 4 S., R. 5 W., Mount Diablo base and meridian, on the west slope of the Montara Mountains, at altitude 1,400 feet above sea level; flows southwestward and southward and enters the Pacific at Halfmoon Bay; length, about 4 miles. San Mateo sheet.

Denverton Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends southward from Denverton to Nurse Slough. Antioch sheet.

Desert Creek; California-Nevada; rises in Mono County, Cal., in the western part of T. 7 N., R. 24 E., Mount Diablo base and meridian, in Lobdel Lake, at

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altitude 9,250 feet above sea level; flows in a general northerly direction to the lower end of Smith Valley, on West Walker River, where its waters sink; length, about 24 miles; fall, 4,250 feet; water is diverted to Desert Creek from Deep Creek through a ditch to Lobdel Lake. Bridgeport and Wellington sheets.

Deshecha Canada, Prima; Orange County; an intermittent stream, 5 miles long, flowing southwesterly and entering the Pacific 1 mile northwest of the mouth of Segunda Deshecha Canada. Capistrano sheet.

Deshecha Canada, Segunda; Orange County; an intermittent stream about 5 miles long, flowing southwesterly into the Pacific. Capistrano sheet.

Devil Canyon Creek; Klamath River basin; Trinity County; rises in the southern part of T. 36 N., R. 12 W., Mount Diablo base and meridian; flows westward 7 miles into New River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Devil Canyon Creek; Riverside County; an intermittent stream, 3 miles long, flowing eastward into the Colorado Desert. Indio special sheet.

Devil Canyon Creek; San Mateo Creek basin; San Diego County; rises on the eastern slope of the Santa Margarita Mountains, at altitude 2,300 feet above sea level; flows northward 2 miles and then turns abruptly and flows westerly through the mountains to its junction with San Mateo Creek (tributary to the Pacific); length, about 8 miles; fall, 1,800 feet; principal tributary, Cold Spring Canyon Creek; intermittent. San Luis Rey sheet.

Devil Canyon Creek; Santa Ana River basin; San Bernardino County; rises in the western part of T. 2 N., R. 4 W., San Bernardino base and meridian, at altitude 4,250 feet above sea level: flows southward to San Bernardino Valley; its mountain basin comprises about 8 square miles. Gaging station near San Bernardino (1911–12). San Bernardino sheet.

Devil Canyon Creek; Santa Clara River basin; Los Angeles and Ventura counties; rises in the northwestern part of T. 5 N., R. 17 W., San Bernardino base and meridian, at altitude 2,500 feet above sea level; flows southwestward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 6 miles; fall, 1,500 feet. Tejon and Camulos sheets.

Devil Creek; Los Angeles River basin; Los Angeles County; an intermittent stream, rising in the eastern part of T. 3 N., R. 17 W., San Bernardino base and meridian, on the southern slope of Santa Susana Mountains, and flowing southeasterly to San Fernando Valley. The upper course of this creek lies through Aliso Canyon. Santa Susana sheet.

Devils Basin lakes; Eldorado County; southwestern part of T. 12 N., R. 17 E., Mount Diablo base and meridian, 1 mile northeast of Pyramid Peak; a group of glacial lakelets without outlet; the largest of the group is nearly 1 mile long and about half a mile wide; the others, about 24 in number, are all very small; altitude of all, about 8,100 feet above sea level. Pyramid Peak sheet.

Devils Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the central part of T. 3 N., R. 10 W., San Bernardino base and meridian, on the north slope of Waterman Peak, at altitude 6,400 feet above sea level; flows south of west 3 miles, then in general southward 6 miles to its junction with the West Fork of San Gabriel River (tributary to San Gabriel River, which discharges to the Pacific); fall, 4,200 feet. Rock Creek and Pomona sheets.

Devils Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the southeastern part of T. 3 N., R. 9 W., San Bernardino base and meridian, at altitude 6,250 feet above sea level; flows in general southeastward to its junction with San Gabriel River (tributary to the Pacific), half a mile below The Narrows; length, about 3½ miles; fall, 3,600 feet. Rock Creek sheet.

Devils Slough; Santa Clara County; in the tidal marsh at the southern end of San Francisco Bay. Palo Alto sheet.

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Dewitt Canyon Creek; Los Angeles County; an intermittent stream, 1½ miles long, rising on the north slope of the Santa Susana Mountains and flowing northeastward to Pico Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, about 1,000 feet. Santa Susana sheet.

Diablo Canyon Creek; San Luis Obispo County; rises in the San Luis Mountains, 1 mile northeast of Saddle Peak, at altitude 1,300 feet above sea level; flows south of west 5 miles to the point at which it enters the Pacific. Port Harford sheet.

Diablo Canyon Creek; San Roque Creek basin; Santa Barbara County; an intermittent stream, about 2 miles long, flowing west of south toward the valley drained by San Roque Canyon Creek, which discharges to the Pacific; sinks before reaching the creek. Santa Barbara special sheet.

Diamond Creek; Alameda County; rises in San Antonio Rancho, 2 miles northeast of East Oakland; flows northwestward about 2 miles, then west of south 4 miles to Alameda, to the tidal marsh through which it enters San Leandro Bay, a branch of San Francisco Bay; principal tributary, Shepard Creek. Concord sheet.

Diez Creek; Inyo County; Sequoia National Forest; rises on the east slope of the Sierra about 1½ miles east of Mount Langley at altitude 11,600 feet above sea level; flows northeastward to its junction with Tuttle Creek which discharges to Owens Valley; length, 8 miles; fall, 7,000 feet, of which 5,500 feet is made in the first 4 miles. Mount Whitney sheet.

Digger Creek; Klamath River basin; Trinity County; rises in the western part of T. 35 N., R. 8 W., Mount Diablo base and meridian, at altitude 3,500 feet above sea level; flows southeastward into East Fork of Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 2 miles; fall, 1,400 feet. Red Bluff sheet.

Digger Creek; Mendocino County; rises in the southwestern part of T. 18 N., R. 17 W., Mount Diablo base and meridian; flows in general northwestward; enters the Pacific near Beaver Point; length, 3 miles. Punnett's map of Mendocino County.

Dike Creek; San Bernardino County; rises in the southwestern part of T. 2 N., R. 2 W., San Bernardino base and meridian, at altitude 6,250 feet above sea level; flows southwestward into Plunge Creek (tributary to Santa Ana River, which discharges to the Pacific); length, about 2 miles; fall, 1,500 feet. Redlands sheet.

Dinsmore Canyon Creek; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains, in the Santa Barbara National Forest, at altitude 2,600 feet above sea level; flows southward, and enters the Pacific Ocean near Miramar; length, 4½ miles; intermittent below mouth of canyon. Santa Barbara special map.

Ditton Creek; Siskiyou County; rises in the northwestern part of T. 15 N., R. 5 E., Humboldt base and meridian; takes a very irregular but in general southeasterly course to its junction with Klamath River (tributary to the Pacific); length, including major windings, about 14 miles; many small unnamed tributaries draining the eastern slopes of Siskiyou Mountains. Punnett's map of Siskiyou County.

Division Creek; Inyo County; Inyo National Forest; rises on the south slope of Coliseum Mountain at altitude 10,500 feet above sea level; flows northeastward 7 miles into Owens Valley, where its water sinks; fall, 6,650 feet. Gaging station near Independence (1906–1911). Mount Whitney sheet.

Doane Creek; San Diego County; rises in the northern part of T. 10 S., R. 1 E., San Bernardino base and meridian, at altitude 5,000 feet above sea level; flows northwestward about 2 miles into Pauma Creek (tributary to San

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Luis Rey River, which discharges to the Pacific); fall, 500 feet; intermittent. Ramona sheet.

Dobbin Creek; Trinity and Humboldt counties; rises in the eastern part of T. 3 S., R. 6 E., Humboldt base and meridian; flows in general northwestward to its junction with Eel River (tributary to the Pacific); length, 11 miles; principal tributary, Conly Creek. Punnett's maps of Trinity and Humboldt counties.

Dog Creek; Truckee River basin; Sierra County; rises in the southeastern part of T. 20 N., R. 17 E., Mount Diablo base and meridian, at altitude 6,900 feet above sea level; flows northeastward 3 miles, then southeastward 3½ miles into Truckee River (tributary to Pyramid and Winnemucca lakes) near Verdi, Nev.; fall, about 2,000 feet. Sierraville and Reno sheets.

Dog Creek; Walker River basin; Mono County; rises in the southwestern part of T. 3 N., R. 25 E., Mount Diablo base and meridian, at altitude 9,700 feet above sea level; flows northeastward to its junction with Virginia Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); length, about 8 miles; fall, 2,800 feet. Bridgeport sheet.

Dollar Lake; San Bernardino County; southeastern part of T. 1 N., R. 1 E., San Bernardino base and meridian; a very small lake at the head of the South Fork of Santa Ana River (tributary through Santa Ana River to the Pacific); altitude, 9,250 feet. San Gorgonio sheet.

Donahue Creek; Mendocino County. *See* Greenwood Creek.

Don Juan Creek; Trinity County; rises in the northwestern part of T. 5 N., R. 7 E., Humboldt base and meridian; flows east of south 3 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Donner Creek; Nevada County; rises in the western part of T. 17 N., R. 16 E., Mount Diablo base and meridian, in Donner Lake, at altitude 5,939 feet above sea level; flows eastward to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes); length, about 2 miles; fall, about 400 feet. Gaging station near Truckee (1902–1912). Truckee sheet.

Donner Lake; Nevada County; T. 17 N., Rs. 15 and 16 E., Mount Diablo base and meridian; inlets, a number of small streams draining eastern Sierra slopes; outlet, Donner Creek to Truckee River (tributary to Pyramid and Winnemucca lakes); the lake is about 3 miles long, has a nearly uniform width of a little more than one-half mile, and lies immediately north of and below the line of the Southern Pacific Railroad where the ascent of the Sierra is made from the east. Truckee sheet.

Doolan Canyon Creek. *See* Cottonwood Creek, Alameda Creek basin.

Doolittle Creek; Siskiyou County; rises in the eastern part of T. 17 N., R. 6 E., Humboldt base and meridian; flows southeastward 6 miles to its junction with Indian Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Dos Pueblos Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, 2 miles south of east from Santa Ynez Peak, at altitude 2,150 feet above sea level; flows somewhat west of south 6 miles to the point at which it enters the Pacific Ocean near Naples. Goleta special sheet.

Dougherty Creek; Mendocino County; rises in the northwestern part of T. 15 N., R. 13 W., Mount Diablo base and meridian; flows northwestward to its junction with the South Fork of Big River (tributary through Big River to the Pacific) in the western part of T. 16 N., R. 14 W.; length, 8 miles. Punnett's map of Mendocino County.

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Dry Canyon Creek; Ballona Creek basin; Los Angeles County; an intermittent stream, about 3½ miles long, draining a small area in the Santa Monica Mountains and flowing southeastward to San Jose de Buenos Ayres Rancho. Santa Monica sheet.

Dry Canyon Creek; Los Angeles County; an intermittent stream, 1½ miles long, rising on the southern slope of Santa Monica Mountains in the southeastern part of T. 1 S., R. 18 W., San Bernardino base and meridian, and flowing southerly to Solstice Canyon Creek, which discharges to the Pacific Ocean. Camulos sheet.

Dry Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream, 3 miles long, rising in the southwestern part of T. 1 N., R. 17 W., San Bernardino base and meridian, and flowing east of north into Arroyo Calabasas, which discharges into San Fernando Valley. Calabasas sheet.

Dry Canyon Creek; Santa Clara River basin; Los Angeles County; rises in the northwestern part of T. 5 N., R. 15 W., San Bernardino base and meridian; flows southward into Deadman Canyon through which it is tributary to Santa Clara River, which discharges to the Pacific; length, about 10 miles. Tejon and Santa Susana sheets.

Dry Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 4 miles long, rising in the Santa Barbara National Forest and flowing northwestward into Santa Barbara Canyon Creek (tributary to Cuyama River—Santa Maria River—which discharges to the Pacific). Santa Ynez sheet.

Dry Canyon Creek; Santa Maria River basin; Ventura County; rises in the eastern part of T. 8 N., R. 22 W., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows northwestward 2 miles, then southwestward 8 miles to Cuyama River (Santa Maria River, which discharges to the Pacific); intermittent. Mount Pinos sheet.

Dry Creek; Alameda Creek basin; Alameda County; an intermittent stream, 4½ miles long, rising in the southwestern part of T. 3 S., R. 3 E., Mount Diablo base and meridian, on the north slope of Crane Ridge, and flowing northwestward to Arroyo Mocho (tributary through Arroyo las Positas to Arroyo de la Laguna, and thus to Alameda Creek, which discharges to San Francisco Bay). Tesla sheet.

Dry Creek; Alkali Lake basin; Modoc County; rises on the east slope of Warner Mountains, at altitude 5,800 feet above sea level; flows northeastward into Middle Alkali Lake; length, 4 miles; fall, 1,100 feet. Alturas sheet.

Dry Creek; Cameros Valley Creek basin; Santa Barbara County; an intermittent stream, three-fourths mile long, flowing southeastward into Cameros Valley Creek, which discharges to the Pacific. Goleta special sheet.

Dry Creek; Coyote River basin; Santa Clara County; rises in the southeastern part of Yerba Buena Rancho, at altitude 1,250 feet above sea level; flows northeastward to a marshy area in the valley of Coyote River (tributary to San Francisco Bay) east of the city of San Jose. Mount Hamilton and San Jose sheets.

Dry Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 48 N., R. 6 W., Mount Diablo base and meridian, at altitude 3,800 feet above sea level; flows southeastward 7 miles into Klamath River (tributary to the Pacific) opposite and just below the mouth of Little Bogus Creek; fall, about 1,700 feet; intermittent. Shasta sheet.

Dry Creek; Mohave River basin; San Bernardino County; rises in the northeastern part of T. 1 N., R. 2 W., San Bernardino base and meridian, on the northwest slope of Keller Peak, at altitude 6,750 feet above sea level; flows

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northwestward 2 miles into Deep Creek (tributary to Mohave River); fall, 850 feet. Redlands sheet.

Dry Creek; Russian River basin; Mendocino and Sonoma counties; rises in the northwestern part of T. 12 N., R. 12 W., Mount Diablo base and meridian; flows very irregularly southeastward to its junction with Russian River (tributary to the Pacific) 2 miles south of Healdsburg; length, including major windings, 38 miles; many small branching tributaries, of which Soda Spring, Galloway, Warm Spring, and Pena are named on the map. Punnett's maps of Mendocino and Sonoma counties.

Dry Creek; Santa Clara River basin; Ventura County; rises in the southeastern part of T. 8 N., R. 20 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows southeastward to its junction with Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) 1 mile southeast of Bear Mountain; lower course lies through Bear Gulch; length, about 7 miles; fall, 1,900 feet. Tejon sheet.

Dry Creek; Trinitas Creek basin; San Mateo County; a stream, about 2 miles long, draining a small area in the northwestern part of San Gregorio Rancho and flowing south of west to Trinitas Creek, which discharges to the Pacific; fall, about 500 feet. Santa Cruz sheet.

Dry Creek; Truckee River basin; Nevada County; rises in the northeastern part of T. 18 N., R. 16 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southeastward to its junction with Little Truckee River (tributary through Truckee River to Pyramid and Winnemucca lakes); length, 5 miles; fall, about 450 feet. Truckee sheet.

Dry Gulch Creek; Los Angeles County; rises in the northern part of T. 2 N., R. 8 W., San Bernardino base and meridian, on the east slope of Iron Mountain, at altitude 7,250 feet above sea level; flows southwestward into Coldwater Canyon Creek (tributary through Cattle Creek to San Gabriel River, which discharges to the Pacific); length, 1½ miles; fall, 3,350 feet; intermittent. San Antonio sheet.

Dry Lake; Santa Ana River basin; Riverside County; a small water body, marked as permanent on the Riverside sheet, lying 4 miles north of Santa Ana River, about 7 miles north of west of Riverside; altitude, about 700 feet; neither inlet nor outlet shown on the map. Riverside sheet.

Dry Lake; Santa Ana River basin; San Bernardino County; southeastern part of T. 1 N., R. 1 E., San Bernardino base and meridian; outlet, a stream 1 mile long, flowing northwestward to the South Fork of Santa Ana River (tributary to Santa Ana River, which discharges to the Pacific); altitude, 9,050 feet; fall of outlet, 750 feet. San Gorgonio sheet.

Duck Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends southeastward from Suisun to Hill Slough. Napa sheet.

Dulzura Creek; Otay River basin; San Diego County; rises in the southeastern part of T. 17 S., R. 2 E., San Bernardino base and meridian, at altitude 2,600 feet above sea level; flows very irregularly westward to its junction with Jamul Creek (tributary to lower Otay reservoir); fall, about 2,000 feet; intermittent. The water is diverted from Cottonwood and Pine Valley creeks by way of Dulzura canal to Dulzura Creek. Cuyamaca sheet.

Dume Canyon Creek; Los Angeles County; rises on the southern slope of the Santa Monica Mountains, in T. 1 S., R. 19 W., San Bernardino base and meridian; flows east of south about 6 miles into the Pacific Ocean. Camulos sheet.

Dutch Creek; Illinois River basin; Siskiyou County; rises in the northwestern part of T. 47 N., R. 10 W., Mount Diablo base and meridian; flows northwestward about 3 miles, then northward 1½ miles into Elliott Creek (tributary

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to Applegate Creek and thus through Rogue River to Illinois River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Dutch Creek; Klamath River basin; Siskiyou County; rises in the northern part of T. 47 N., R. 7 W., Mount Diablo base and meridian, on the north slope of Ash Peak; flows southwestward 6 miles into Klamath River (tributary to the Pacific) near Gottville. Punnett's map of Siskiyou County.

Dutch Charles Creek; Mendocino County; rises in the northeastern part of T. 21 N., R. 17 W., Mount Diablo base and meridian; flows eastward 4 miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Dutch Henry Creek; Mendocino County; rises in the western part of T. 16 N., R. 15 W., Mount Diablo base and meridian, 1 mile east of Keenes Summit; flows in general southeastward into the North Fork of the North Fork of Navarro River (tributary through Navarro River to the Pacific); length, 3 miles. Punnett's map of Mendocino County.

Eagle Canyon Creek; Santa Ana River basin; Riverside County; an intermittent stream, about 3 miles long, flowing northeastward to Temescal Wash (tributary to Santa Ana River, which discharges to the Pacific) 1 mile south of Corona; it is joined by Gypsum Canyon Creek just below its canyon. Corona sheet.

Eagle Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains, at altitude about 1,100 feet above sea level; flows almost due south to the point at which it enters the Pacific; length, 4½ miles. Goleta special sheet.

Eagle Creek; Alkali Lake basin; Modoc County; rises on the east slope of Warner Mountains, east of Eagle Peak, at altitude 8,000 feet above sea level; flows northeastward about 6 miles; sinks in Surprise Valley, in the flat between Middle and Lower Alkali lakes, to which the basin is topographically tributary; fall, 3,300 feet. Alturas sheet.

Eagle Creek; Klamath River basin; Trinity County; rises in the northeastern part of T. 38 N., R. 8 W., Mount Diablo base and meridian, on the east slope of Scott Mountains; flows in general south of east to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 5 miles. Punnett's map of Trinity County.

Eagle Creek; Walker River basin; Mono County; rises in the southwestern part of T. 4 N., R. 24 E., Mount Diablo base and meridian, 1 mile southeast of Eagle Peak, at altitude 10,100 feet above sea level; flows northeastward about 5½ miles to its junction with Buckeye Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); fall, 3,100 feet. Bridgeport sheet.

Eagle Lake; Lassen County, Cal.; no outlet; principal inlet, Pine Creek; length (northeast-southwest), about 15 miles; maximum width, 6 miles; altitude, 5,115 feet; water, fresh, "in this respect forming an exception to the usual saline condition of inclosed lakes, but in this instance the waters are supposed, with good reason, to escape through the gravels underlying the lava overflow which has checked the drainage of the valley."[1]

The lake covers 27,800 acres, is very deep, and is said to have been sounded to a depth of 1,900 feet. "It is popularly supposed to be a great source of water supply, if it could be 'tapped,' and some money has been spent for this purpose, but as the lake is a sink and has adjusted its surficial area to evaporation and inflow, it is not possible to obtain any great water supply therefrom except by

[1] Russell, I. C., A geological reconnaissance in southern Oregon; Fourth Ann. Rept. U. S. Geol. Survey, 1884, p. 454.

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drawing it down to such an elevation that the area exposed to evaporation will be materially reduced."[1] Honey Lake sheet.

Eagle Lake; Truckee River basin; Eldorado County; southern part of T. 13 N., R. 17 E., Mount Diablo base and meridian, on the west slope of Maggie's Peak; inflowing streams drains a group of small lakes; outlet, a stream, 1 mile long, flowing northeastward to Emerald Bay, Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); altitude, 7,250 feet; fall of outlet, 1,025 feet. Pyramid Peak sheet.

Earl Lake; Del Norte County; Tps. 16 and 17 N., R. 1 W., Humboldt base and meridian; inlet, Talowa Creek; no outlet shown on maps; ridge between the coast and Lake Talowa, the western arm of Lake Earl, about one-eighth mile wide. Punnett's map of Del Norte County: Land Office map of California, 1907.

East branch or fork. *See* name of main stream.

East Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising in the east-central part of T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing northwestward to Gavin Canyon, which discharges through Wiley Canyon Creek toward Santa Clara River (tributary to the Pacific) between Placerita and Pico Canyon creeks; tributary, Rice Canyon Creek. Santa Susana sheet.

East Creek; Alameda County; rises in San Antonio Rancho, about 3 miles east of East Oakland; flows west of south to the tidal marsh through which it enters San Leandro Bay, a branch of San Francisco Bay. Concord sheet.

East Lake; Mono County; southeastern part of T. 3 N., R. 24 E., Mount Diablo base and meridian; outlet, a stream 1 mile long, flowing northward to the West Fork of Green Creek (tributary through Green Creek to Virginia Creek and thus through East Walker River to Walker River, which discharges to Walker Lake); altitude, 9,464 feet; fall of outlet, 664 feet. Bridgeport sheet.

Eastman Gulch Creek; Trinity County; rises in the southwestern part of T. 34 N., R. 7 W., Mount Diablo base and meridian; flows south of west 5 miles to its junction with Trinity River (tributary to Klamath River which flows to the Pacific). Punnett's map of Trinity County.

East Walker River. *See* Walker River.

Eaton Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the eastern part of T. 2 N., R. 12 W., San Bernardino base and meridian, on the south slope of San Gabriel Peak, at altitude 4,500 feet above sea level; flows southeastward 2 miles, then southwestward about 2 miles to the edge of the valley northeast of Pasadena. The wash extends southeastward with a width of about half a mile and appears to be lost in the plain 5 or 6 miles below the mouth of the canyon; only at times of very high and prolonged floods do the waters of Eaton Creek reach the San Gabriel (tributary to the Pacific) 8 or 10 miles away. Pasadena sheet; Hall, Wm. Ham., Irrigation in California, Sacramento, 1888, p. 379.

Ebbens Creek; Riverside County; an intermittent stream draining southeastward to Dead Indian Creek, which discharges to the Colorado Desert. Indio special sheet.

Echo Falls Canyon Creek; Ventura County; an intermittent stream, about 2 miles long, rising in the southwestern part of T. 5 N., R. 21 W., San Bernardino base and meridian, in the Santa Barbara National Forest, and flowing east of south into Santa Paula Creek (tributary to Santa Clara River, which discharges to the Pacific). Santa Paula sheet.

Eckart Canyon Creek; Santa Barbara County; an intermittent stream, 3½ miles long, rising in the eastern part of T. 10 N., R. 29 W., San Bernardino base and meridian, and flowing northeastward to Powell Canyon Creek (tributary

[1] Second Ann. Rept. U. S. Reclamation Service, 1902–3, pp. 118–119.

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to Cuyama River, Santa Maria River, which discharges to the Pacific) below the mouth of Kelsey Canyon. Santa Ynez sheet.

Eddys Creek; Siskiyou County; rises in the northwestern part of T. 39 N., R. 11 W., Mount Diablo base and meridian; flows northeastward into North Fork of Salmon River (tributary through Salmon River to Klamath River, which discharges to the Pacific); length, 3 miles; tributary, a stream 4 miles long, rising in the eastern part of T. 39 N., R. 11 E., and flowing northwestward. Punnett's map of Siskiyou County.

Eden Creek; Eel River basin; Mendocino County; rises in the west-central part of T. 20 N., R. 12 W., Mount Diablo base and meridian; flows east of north 5 miles, then in a general easterly course 4 miles to its junction with Elk Creek (tributary through Middle Fork of Eel River to Eel River, which discharges to the Pacific); passes through Eden Valley. Punnett's map of Mendocino County.

Eden Creek; San Lorenzo Creek basin; Alameda County; rises on the west slope of Divide Ridge, in the southwestern part of T. 2 S., R. 1. W., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows southwestward 3 miles to Palomeras Creek (tributary through San Lorenzo Creek to San Francisco Bay); principal tributary, Hollis Creek. Pleasanton and Haywards sheets.

Edwards Creek; Mendocino County; rises in the southwestern part of T. 12 N., R. 11 W., Mount Diablo base and meridian; flows somewhat north of east to its junction with Russian River (tributary to the Pacific) near Echo; length, 5 miles. Punnett's map of Mendocino County.

Eel River; Glenn, Lake, Mendocino, Trinity, and Humboldt counties; rises in Glenn County, in the northern part of T. 20 N., R. 8 W., Mount Diablo base and meridian; flows southeastward 3 miles, then takes a general southwesterly course, crosses the northern part of Lake County, enters Mendocino County in the southern part of T. 18 N., R. 11 W., whence its general course is northwestward to the western part of T. 3 N., R. 2 W., Humboldt base and meridian, where it enters the Pacific; length, including major windings, which are many, about 175 miles; principal tributaries, Middle, North, and South forks, and Van Duzen River; above the mouth of the Middle Fork the main stream is called South Eel River.

The lower portion of the drainage area below the mouth of the South Fork is in the redwood belt; the remainder of the area is semi-open and contains very little merchantable timber except on a small tract near Grizzly Mountain.

The low lands are fertile and well cultivated; the rolling and hill lands are covered with grass and are used only for grazing. Precipitation throughout the entire drainage area is very heavy during the winter months.

Water is diverted from the South Eel to the basin of the East Fork of Russian River where it is used by the Snow Mountain Power Company for power development.

Gaging stations at Hearst (South Eel) (1910–1912); near Laytonville (1911–12); and at Scotia (1910–1912).

Authorities: Punnett's maps of Glenn, Lake, Mendocino, Trinity, and Humboldt counties; Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 175.

Eel River, Middle Fork; Glenn, Trinity, and Mendocino counties; formed in Mendocino County in the southern part of T. 23 N., R. 11 W., Mount Diablo base and meridian, by the union of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the Middle Fork, rises in Trinity County in the northeastern part of T. 26 N., R. 11 W.; flows westward 3 miles, then takes a general southerly course to the point at which it receives the South Fork; below these forks the Middle Fork winds very irregularly southward to the eastern part of T. 21 N., R. 12 W.,

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whence its general course is north of west to its point of junction with the Eel in the southwestern part of T. 22 N., R. 13 W.; length of the Middle Fork from Eel River to the head of its North Fork, including major windings, about 55 miles; principal tributaries below the mouth of the South Fork, Round Valley, Hayshed, Thatcher, and Elk creeks. Gaging station near Covelo (1911–12). Punnett's maps of Glenn, Trinity, and Mendocino counties.

Eel River, Middle Fork, North Fork of. *See* Eel River, Middle Fork.

Eel River, Middle Fork, South Fork of; Glenn and Mendocino counties; rises in Glenn County in the eastern part of T. 20 N., R. 9 W., Mount Diablo base and meridian; flows northwestward about 24 miles to the south-central part of T. 23 N., R. 11 W., where it unites with the North Fork of Middle Fork to form the Middle Fork of Eel River (tributary to Eel River, which discharges to the Pacific); only tributary named on the map, Cold Creek. Punnett's map, of Mendocino County.

Eel River, North Fork; Trinity, Mendocino, and Humboldt counties; rises in Trinity County in the southeastern part of T. 2 S., R. 6 E., Humboldt base and meridian; flows southeastward 22 miles to the central part of T. 5 S., R. 8 E., whence its course is westward, southward, and north of west to the point at which it unites with the Eel (tributary to the Pacific); length, about 35 miles; principal tributaries, Salt and Hull creeks. Punnett's maps of Trinity, Mendocino, and Humboldt counties.

Eel River, Rice Fork; Lake County; rises in the northern part of T. 16 N., R. 8 W., Mount Diablo base and meridian; flows northwestward to its junction with Eel River (tributary to the Pacific); length, 16 miles; principal tributaries, Bear and Rice creeks. Land Office map of California, 1907; Punnett's map of Lake and Mendocino counties.

Eel River, South. *See* Eel River.

Eel River, South Fork; Mendocino and Humboldt counties; rises in the northeastern part of T. 20 N., R. 15 W., Mount Diablo base and meridian; takes a general northwesterly course to Dyerville in the southeastern part of T. 1 S., R. 2 E., Humboldt base and meridian, where it unites with Eel River (tributary to the Pacific); length, including major windings, about 75 miles; principal tributaries, Dutch Charles, Rock, Elder, Rattlesnake, Big Dan, Cedar, Hollow Tree, Red Mountain, Indian, Milk Ranch, Fish, Sproul, Redwood, Dean Canyon, Rocky Glen, Salmon, Elk, Canoe, and Ball creeks, and East Branch of South Fork. Gaging station at Garberville (1911–12). Punnett's map of Mendocino and Humboldt counties.

Eel River, South Fork, East Branch of; Mendocino and Humboldt counties; rises in the southwestern part of T. 5 S., R. 5 E., Humboldt base and meridian; flows south of west 3 miles, then in general northwesterly to its junction with South Fork of Eel River (tributary to Eel River, which discharges to the Pacific); principal tributaries Elkhorn, Squaw, and Buck Mountain creeks; length, about 14 miles. Punnett's maps of Mendocino and Humboldt counties.

Eightmile Creek; Modoc County; rises in the northeastern part of Lake County on the northern slope of Bidwell Peak; flows eastward 2 miles, then southeastward 3 miles into Cow Head Lake; fall, about 500 feet. Alturas sheet.

El Corte de Madera Creek; San Gregorio Creek basin; San Mateo County; rises in the western part of T. 6 S., R. 4 W., Mount Diablo base and meridian, near Sierra Morena, at altitude 2,000 feet above sea level; flows westward 1 mile, then southerly 7 miles to its junction with San Gregorio Creek, which discharges to the Pacific; fall, about 1,900 feet. Santa Cruz sheet.

Elder Canyon Creek; San Diego County; rises in the west-central part of T. 9 S., R. 4 E., San Bernardino base and meridian, at altitude 5,100 feet above

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sea level; flows in general northeastward to Coyote Canyon, which discharges to Borego Valley; length, about 7 miles. Ramona sheet.

Elder Creek; Mendocino County; rises in the southwestern part of T. 22 N., R. 15 W.; flows north of west 3 miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Eldorado Creek; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains, in T. 4 N., R. 25 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows southeastward 3 miles to its junction with Steer Creek with which it forms Gobernador Creek (tributary to Carpinteria Creek, which discharges to the Pacific); fall, 2,150 feet. Ventura sheet.

El Callejon Creek. *See* El Jaro Creek.

Elizabeth Lake; Los Angeles County; the southwestern part of T. 7 N., R. 14 W., San Bernardino base and meridian; occupies a depression in an alluvial trough coinciding with the San Andreas fault zone; receives the drainage of a small area in the surrounding hills and may be fed by springs. Its waters are fairly fresh, for at the northwest end it overflows occasionally into the smaller Hughes Lake, which in turn feeds the headwaters of a southward flowing stream that is part of the Santa Clara drainage basin. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 14 and Pl. VI.

Elizabeth Lake Canyon Creek; Los Angeles County; rises in the southern part of T. 7 N., R. 15 W., San Bernardino base and meridian; flows southwestward into Castac Creek (tributary to Santa Clara River, which discharges to the Pacific). See Hughes and Elizabeth lakes. The creek drains a mountainous country in which altitudes range from 1,200 to 3,200 feet above sea level; principal tributaries, Fish and Ruby Canyon creeks. Tejon sheet.

El Jaro Creek; Santa Ynez River basin; Santa Barbara County; rises on the north slope of the Santa Ynez Mountains in San Julian Rancho, at altitude about 1,300 feet above sea level; flows southwestward 5 miles, then northwestward 7 miles into Salsipuedes Creek, through which it is tributary to Santa Ynez River (tributary to the Pacific Ocean); called El Callejon Creek at its head; principal tributaries below El Callejon, Llanito Creek, Yridisis, Ytias, and Los Amoles creeks. Lompoc sheet.

Elk Creek; Eel River basin; Humboldt County; rises in the western part of T. 2 S., R. 4 E., Humboldt base and meridian; flows northwestward 4 miles into South Fork of Eel River (tributary to Eel River, which flows to the Pacific). Punnett's map of Humboldt County.

Elk Creek; Eel River basin; Mendocino County; rises in the northern part of T. 19 N., R. 10 W., Mount Diablo base and meridian, on the west slope of Mount Hull; flows northwestward to its junction with Middle Fork of Eel River (tributary to Eel River, which flows to the Pacific); length, 15 miles; principal tributary, Eden Creek. Punnett's map of Mendocino County.

Elk Creek; Klamath River basin; Siskiyou County; rises in the western part of T. 43 N., R. 12 W., Mount Diablo base and meridian, in a small lake on the east slope of Marble Mountain; flows in general northwestward to its junction with Klamath River (tributary to the Pacific) 1 mile southwest of Happy Camp in T. 16 N., R. 7 E., Humboldt base and meridian; length, about 18 miles. Punnett's map of Siskiyou County.

Elk Creek; Mendocino County; rises in the northern part of T. 13 N., R. 15 W., Mount Diablo base and meridian; flows northwestward and enters the Pacific at Greenwood Landing; length, 12 miles. Punnett's map of Mendocino County.

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Elkhart Creek; Monterey County; rises in the central part of T. 12 S., R. 3 E., Mount Diablo base and meridian; flows southwestward to Moss, where it enters the Pacific in Monterey Bay; length, about 8 miles. Land Office map of California, 1907.

Elkhorn Creek; Mendocino County; rises in the western part of T. 24 N., R. 16 W., Mount Diablo base and meridian, on the east slope of Red Mountain; flows northeastward 1½ miles, then northwestward about 4 miles into the East Branch of the South Fork of Eel River (tributary through South Fork of Eel River to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Elk River; Humboldt County; rises in the central part of T. 3 N., R. 1 E., Humboldt base and meridian; flows northwestward and discharges into Humboldt Bay near the town of Elk River; length, about 12 miles; principal tributaries, North and South forks. Punnett's map of Humboldt County.

Elk River, North Fork; Humboldt County; rises in the northwestern part of T. 3 N., R. 2 E., Humboldt base and meridian; flows in general north of west to its junction with Elk River (tributary to Humboldt Bay); length, about 10 miles; principal tributary, Bridge Creek. Punnett's map of Humboldt County.

Elk River, South Fork; Humboldt County; rises in the eastern part of T. 3 N., R. 1 E., Humboldt base and meridian; flows northwestward to its junction with Elk River (tributary to Humboldt Bay); length, about 5 miles. Punnett's map of Humboldt County.

Ellery Lake; Mono County; Mono National Forest; central part of T. 1 N., R. 25 E., Mount Diablo base and meridian; inlet, Leevining Creek, which flows through the lake into Mono Lake; altitude, about 9,500 feet. Mount Lyell sheet.

Elliott Creek; Jackson County, Oreg., and Siskiyou County, Cal.; rises in the southern part of Jackson County; flows southwestward into Siskiyou County, Cal., in the central part of T. 48 N., R. 9 W., Mount Diablo base and meridian, then takes a general westerly course to its junction with Applegate Creek (tributary through Rogue River to Illinois River, which flows to the Pacific) in the western part of T. 48 N., R. 11 W.; principal tributary, Dutch Creek. Punnett's map of Siskiyou County.

Ellysly Creek; San Luis Obispo County; rises in T. 28 S., R. 9 E., Mount Diablo base and meridian; flows southeastward into Villa Creek, which discharges to the Pacific; about 2 miles long. Cayucos sheet.

Elm Creek; Ventura County; an intermittent stream, half a mile long, flowing southwestward into Tar Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Elsinore Lake; Riverside County; Tps. 5 and 6 S., Rs. 4 and 5 W., San Bernardino base and meridian; a body of brackish water which occasionally receives the flood waters of San Jacinto River and at long intervals may discharge through Temescal Wash to Santa Ana River (tributary to the Pacific); the lake is nearly 5 miles long (northwest-southeast) and about 2 miles wide; altitude, 1,220 feet above sea level. See San Jacinto River. Elsinore sheet.

Elwood Canyon Creek. *See* Bell Canyon Creek.

Emigrant Gulch Creek; Trinity County; rises in the northeastern part of T. 8 N., R. 6 E., Humboldt base and meridian; flows southeastward into New River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 10 miles. Punnett's map of Trinity County.

Empire Creek; Siskiyou County; rises in the northwestern part of T. 47 N., R. 7 W., Mount Diablo base and meridian; flows southwestward 6 miles into

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Klamath River (tributary to the Pacific) at Gottville (Empire Mill). Shasta sheet; Punnett's map of Siskiyou County, on which it is not named.

Encinitas Creek; San Diego County; rises in the southwestern part of T. 12 S., R. 3 W., San Bernardino base and meridian, at altitude 900 feet above sea level; flows southwestward and southward into San Elijo Lagoon, a brackish-water marsh, 2 miles southeast of Encinitas. The lagoon is separated from the ocean by a narrow sand ridge which may at times be cut through by flood waters of the creek; intermittent. Escondido and Oceanside sheets.

Escondido Creek; Jalama Creek basin; Santa Barbara County; an intermittent stream, about 2¼ miles long, flowing southward into Jalama Creek (tributary to the Pacific) in the western part of San Julian Rancho. Lompoc sheet.

Escondido Canyon Creek; Santa Clara River basin; Los Angeles County; rises in the west-central part of T. 5 N., R. 13 W., San Bernardino base and meridian, at altitude about 3,200 feet above sea level; flows southwestward into Agua Dulce Canyon through which it is tributary to Santa Clara River (tributary to the Pacific Ocean); length, 5 miles; fall, 1,100 feet; intermittent. Fernando sheet.

Escondido Creek; Jalama Creek basin; Santa Barbara County; an intermittent stream, about 2¼ miles long, flowing southward into Jalama Creek (tributary to the Pacific) in the western part of San Julian Rancho. Lompoc sheet.

Escondido Creek; San Diego County; rises in the western part of T. 11 S., R., 1 W., San Bernardino base and meridian, at altitude about 1,800 feet above sea level; flows southwestward, and discharges into the San Elijo Lagoon, a brackish-water marsh 2 miles southeast of Encinitas. The creek is about 25 miles long and the lagoon into which it discharges is separated from the ocean by a narrow sand ridge, which may at times be cut through by flood waters of the creek. Escondido and Oceanside sheets.

Espada Creek; Jalama Creek basin; Santa Barbara County; an intermittent stream, 4 miles long, rising on the south slope of the Lompoc Hills and flowing west of south into Jalama Creek (tributary to the Pacific). Lompoc sheet.

Espinosa Lake; Monterey County; about 5 miles northwest of the city of Salinas; altitude, 13 feet; overflow from the lake passes westward to Alisol Slough, one of the channels through which the flood waters of Salinas River reach Monterey Bay. Salinas Valley map, sheet I.

Estero Americano Creek, Sonoma County; rises in Blucher Rancho 3 miles east of Bloomfield; flows westward into the Pacific, which it enters through a tidal estuary. The southern shore of the estuary forms a part of the northern boundary of Marin County. Punnett's map of Sonoma County.

Estrella Creek; San Luis Obispo County; formed in the central part of T. 26 S., R. 15 E., Mount Diablo base and meridian, by the junction of Cholame and San Juan creeks (q. v.); flows northwestward to its junction with Salinas River (tributary to the Pacific Ocean) south of San Miguel; length below Shandon, about 10 miles; principal tributaries below the two upper forks, Indian, Keyes, Hog Valley, Ranchial, and San Jacinto creeks. Land Office map of California, 1907.

Etiwanda Canyon Creek, East; Santa Ana River basin; San Bernardino County; an intermittent stream, about 3 miles long, rising in T. 2 N., R. 6 W., San Bernardino base and meridian; flows southward into San Bernardino Valley. Cucamonga sheet.

Etna Creek; Siskiyou County; rises in the southeastern part of T. 42 N., R. 11 W., Mount Diablo base and meridian; flows eastward 7 miles, then northeastward 4 miles to its junction with Scott River, through which it is tributary to Klamath River (tributary to the Pacific) in the eastern part of T. 42 N., R.

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9 W. Punnett's map of Siskiyou County. Called Mill Creek on Land Office map, 1907.

Eureka Canyon Creek; Ventura County; an intermittent stream rising on the north slope of Oak Ridge and flowing northwestward to Santa Clara River (tributary to the Pacific); length, about 3 miles. Camulos sheet.

Evans Creek; Klamath River basin; Siskiyou County; rises in the southwestern part of T. 43 N., R. 11 W., Mount Diablo base and meridian; flows west of south 2 miles, south of east 6 miles, northeastward 6 miles, then northward 5 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific); principal tributary, Shackelford Creek. Punnett's map of Siskiyou County. Spelled *Evens* on Land Office map of California, 1907.

Evans Creek; Pescadero Creek basin; San Mateo County; a stream about 3 miles long, rising in the southern part of T. 7 S., R 3 W., Mount Diablo base and meridian, and flowing southward to Peters Creek, through which it is tributary to Pescadero Creek, which discharges to the Pacific. Santa Cruz sheet.

Evey Canyon Creek; Los Angeles County; rises in the north-central part of T. 1 N., R. 8 W., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southeastward 2 miles into San Antonio Canyon, through which it is tributary to Santa Ana River, which discharges to the Pacific; intermittent. Cucamonga sheet.

Ewauna Lake. *See* Klamath River.

Fagan Canyon Creek; Ventura County; an intermittent stream. 2½ miles long, draining a small area in the eastern part of Ex Mission San Buenaventura Rancho and flowing southward toward Santa Clara River (tributary to the Pacific) near Santa Paula. Santa Paula sheet.

Fairview Canyon; Ventura County; a drainage way opening southward to Santa Clara River (tributary to the Pacific) 2½ miles west of Buckhorn. Camulos sheet.

Fall Creek; Los Angeles River basin; Los Angeles County; rises in the San Gabriel Timber Land Reserve, 3 miles southeast of Gleason Mountain, at altitude 4,000 feet above sea level; flows somewhat west of south into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific Ocean); length, 2½ miles; fall, 1,600 feet. Tujunga sheet.

Fall Creek; San Lorenzo River basin; Santa Cruz County; rises in the northwestern part of T. 10 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,600 feet above sea level; flows southeasterly 4 miles into San Lorenzo River (tributary to the Pacific) near Felton; fall, about 1,200 feet. Santa Cruz sheet.

Fall Creek; Siskiyou County. *See* Jennie Creek.

Fallen Leaf Lake; Eldorado County; northeastern part of T. 12 N., R. 17 E., Mount Diablo base and meridian, north of Angora Peak; 1 inlet, draining several small lakes; outlet, a stream about 1 mile long, flowing northward into Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); altitude about 6,350 feet; fall of outlet, 125 feet. Pyramid Peak sheet.

Falls Creek; Owens River basin; Inyo County; Kern National Forest; rises on the east slope of the Sierra, 1½ miles southeast of Olancha Peak, at altitude 8,000 feet above sea level; flows south of east 3 miles into Walker Creek, which discharges to Owens Valley; fall, 3,000 feet. Olancha sheet.

Falls Creek; Santa Ana River basin; San Bernardino County; rises in the southern part of T. 1 N., R. 1 E., San Bernardino base and meridian, at altitude 10,000 feet above sea level; flows southwestward into Mill Creek (tributary to Santa Ana River, which discharges to the Pacific); length, about 4 miles; fall, 4,100 feet. San Gorgonio sheet.

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Fay Creek; Sonoma County; rises in the eastern part of Bodega Rancho; flows west of south 3 miles into Salmon Creek (tributary to the Pacific). Punnett's map of Sonoma County.

Feather Lake; Lassen County; 8 miles northeast of Caribou Lake; between Pine Creek and Susan River; neither inlet nor outlet mapped; altitude, about 5,500 feet above sea level; very small. Lassen Peak sheet.

Featherstone Canyon Creek; San Diego County; rises in the western part of T. 14 S., R. 2 E., San Bernardino base and meridian, at altitude 2,200 feet above sea level; flows southwestward 3 miles, then northwestward 1 mile into Padre Barona Creek (tributary through San Vicente Creek to San Diego River, which discharges to the Pacific through False Bay); intermittent; fall, 850 feet. Cuyamaca sheet.

Felipe Creek; Santa Clara County; rises in the western part of T. 11 S., R. 7 E., Mount Diablo base and meridian, west of Cathedral Peak; flows west of north into Pacheco Creek (tributary to Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 8 miles. Land Office map of California, 1907.

Feliz Creek; Mendocino County; rises in the southeastern part of T. 14 N., R. 13 W., Mount Diablo base and meridian; flows in general southeastward to its junction with Russian River (tributary to the Pacific) near Sanel; principal tributary, Middle Fork. Punnett's map of Mendocino County.

Feliz Creek, Middle Fork; Mendocino County; rises in the east-central part of T. 13 N., R. 13 W., Mount Diablo base and meridian; flows northwestward 1 mile, then eastward 3 miles to its junction with Feliz Creek, through which it is tributary to Russian River (tributary to the Pacific). Punnett's map of Mendocino County.

Ferris Canyon Creek; California-Nevada; rises in Mono County, Cal., in the eastern part of T. 7 N., R. 24 E., Mount Diablo base and meridian, on the east slope of the Sweetwater Mountains, at altitude 11,300 feet above sea level; flows, in general, north of east to its junction with Sweetwater Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake) in Mineral County, Nev.; length, 7 miles; fall, 5,000 feet, of which 3,300 feet occurs in the 3 miles in the canyon; principal tributary, Silverado Canyon Creek. Bridgeport sheet.

Ficay Creek; an intermittent stream rising on the southern slope of the Santa Ynez Mountains and flowing southward and westward to Arroyo de las Ortegas (tributary to the Pacific); length, 2½ miles. Santa Barbara special map.

Fife Creek; Sonoma County; rises in the northwestern part of T. 8 N., R. 10 W., Mount Diablo base and meridian; flows southward 5 miles to its junction with Russian River (tributary to the Pacific) near Guerneville. Punnett's map of Sonoma County.

Figueroa Creek; Santa Barbara County; an intermittent stream, 3 miles long, rising on the south slope of the San Rafael Mountains and flowing southward to Santa Agueda Creek, which discharges to Santa Ynez River (tributary to the Pacific Ocean). Lompoc sheet.

Finny Creek; Santa Cruz County; a stream about 2 miles long flowing southwestward into the Pacific in Año Nuevo Bay. Santa Cruz sheet.

Fish Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising on the southern slopes of Sawmill Mountain, in T. 7 N., R. 16 W., and flowing southwestward into Castac Creek (tributary to Santa Clara River, which discharges to the Pacific); length to head of longest fork, about 10 miles; fall, about 3,400 feet. Tejon sheet.

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Fish Canyon Creek; Los Angeles County; rises in the southwestern part of T. 2 N., R. 10 W., San Bernardino base and meridian, at altitude 3,500 feet above sea level; flows southeastward 5 miles to San Gabriel River (tributary to the Pacific); fall, 2,750 feet; intermittent. Pomona sheet.

Fish Creek; Eel River basin; Humboldt County; rises in the northern part of T. 5 S., R. 4 E., Humboldt base and meridian; flows northwestward 3 miles to the South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Fish Creek; Santa Ana River basin; San Bernardino County; rises about 3 miles east of San Gorgonio Mountain, at altitude 9,700 feet above sea level; flows northwestward 5½ miles to its junction with Santa Ana River (tributary to the Pacific); fall, 3,400 feet. San Gorgonio sheet.

Fish Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising in the western part of T. 7 N., R. 15 W., San Bernardino base and meridian, and flowing southwestward into Elizabeth Lake Canyon Creek (tributary through Castac Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Fish Creek; Santa Clara River basin; Ventura County; rises in the eastern part of T. 6 N., R. 19 W., San Bernardino base and meridian, between White and Cobblestone mountains, at altitude 5,300 feet above sea level; flows southeastward 2 miles, then north of east 2 miles to its junction with Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 3,600 feet; tributary, North Fork. Tejon sheet.

Fish Creek, North Fork; Santa Clara River basin; Ventura County; rises in the northwestern part of T. 6 N., R. 18 W., San Bernardino base and meridian, on the eastern slope of White Mountain, at altitude 4,900 feet above sea level; flows southeastward 2 miles to Fish Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific); fall, 2,900 feet. Tejon sheet.

Fish Fork. *See* San Gabriel River, Fish Fork.

Fish Hole Creek; Klamath County, Oreg.; rises in the eastern part of Klamath County; flows northwestward into South Fork of Sprague River (tributary through Sprague River to Williamson River, and thus through Upper Klamath Lake to Klamath River, which discharges to the Pacific). Klamath sheet.

Fivemile Creek; Klamath County, Oreg.; rises on the east slope of the Black Hills and flows in general southeastward into the North Fork of Sprague River (tributary through Sprague River to Williamson River, and thus through Upper Klamath Lake to Klamath River, which discharges to the Pacific); length, about 10 miles; intermittent. Klamath sheet.

Fleming Creek; San Bernardino County; rises in the south-central part of T. 2 N., R. 3 W., San Bernardino base and meridian, at altitude 5,600 feet above sea level; flows northward into Little Bear Creek (tributary to Deep Creek, which flows into Mohave River); length, about 1 mile; fall, 600 feet. Redlands and Deep Creek sheets.

Fletcher Creek; Modoc County; rises in the northern part of the county, about 4 miles west of Goose Lake; flows southwestward into the South Fork of Willow Creek (tributary to Lost River, which discharges to Rhett Lake); length, about 8 miles. Alturas sheet.

Forsythe Creek; Mendocino County; rises in the northeastern part of T. 17 N., R. 14 W., Mount Diablo base and meridian; flows southeastward 13 miles to its junction with Russian River (tributary to the Pacific) in Yokayo Rancho;

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principal tributaries, Mill and Seward creeks; called Walker Valley Creek for 3 miles at head. Punnett's map of Mendocino County.

Fort Creek; Klamath County, Oreg.; rises near Fort Klamath; flows southwestward into Anna River [Wood River]; length, 2 miles. Klamath sheet.

Fort Goff Creek; Siskiyou County; rises in the central part of T. 18 N., R. 8 E., Humboldt base and meridian; flows east of south 4 miles to its junction with Klamath River (tributary to the Pacific) in the southwestern part of T. 47 N., R. 12 W. Punnett's map of Siskiyou County.

Fort Ross Creek; Sonoma County; rises in the northeastern part of Munis Rancho; flows southwestward and enters the Pacific at North West Cape Harbor; length, 2½ miles. Punnett's map of Sonoma County.

Foster Creek; Mendocino County; rises in the southwestern part of T. 24 N., R. 15 W., Mount Diablo base and meridian; flows southwest and south to its junction with Rattlesnake Creek (tributary through South Fork of Eel River to Eel River, which discharges to the Pacific); length, 4 miles. Punnett's map of Mendocino County.

Fourfork Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2 miles long, rising in the southern part of T. 5 N., R. 19 W., San Bernardino base and meridian, and flowing southwestward into Little Sespe Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Fourmile Creek; Klamath County, Oreg.; rises in Fourmile Lake in the western part of the county; flows southeastward 5 miles, then northeastward 4 miles into Pelican Bay, the western arm of Upper Klamath Lake (outlet, Klamath River, which discharges to the Pacific). Ashland sheet.

Fourmile Lake; Klamath County, Oreg.; outlet, Fourmile Creek to Pelican Bay on Upper Klamath Lake (outlet, Klamath River, which discharges to the Pacific). Ashland sheet.

Fox Creek; Los Angeles County; rises on the south slope of Gleason Mountain in the San Gabriel Timber Land Reserve, at altitude 5,850 feet above sea level; takes an irregular but in general southerly course to its junction with Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); length, about 7 miles; fall, 3,600 feet; intermittent. Tujunga sheet.

Foxen Canyon Creek; Santa Barbara County; rises in the southern part of Sisquoc Rancho, at altitude 1,400 feet above sea level; flows southwestward 2 miles and northwestward 5 miles toward Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific); fall, about 900 feet. Lompoc sheet.

Foxesse Creek; San Bernardino County; rises in the southern part of T. 1 N., R. 1 E., San Bernardino base and meridian, 2 miles east of San Bernardino Mountain, at altitude 10,400 feet above sea level; flows northwestward 5 miles to its junction with Santa Ana River (tributary to the Pacific); fall, 5,600 feet; intermittent. San Gorgonio sheet.

Frank Horan Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; connects with Cordelia Slough. Napa sheet.

Franklin Canyon Creek; Ballona Creek basin; Los Angeles County; an intermittent stream, about 3 miles long, draining a small area in the Santa Monica Mountains and flowing southward to its junction with Coldwater Canyon Creek (tributary to Ballona Creek, which discharges to the Pacific through Ballona Lagoon). Santa Monica sheet.

Franklin Canyon Creek; Santa Barbara County; an intermittent stream, 2 miles long, rising in T. 4 N., R. 25 W., San Bernardino base and meridian, and flowing southwestward to the Pacific through El Estero, a tidal marsh west of Carpinteria. Santa Barbara special sheet.

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Franklin Creek; Arroyo del Hambre Creek basin; Contra Costa County; rises in the southeastern part of Canada del Hambre Rancho, at altitude 600 feet above sea level; flows southeastward along the north base of Franklin Ridge about 4 miles, then northeastward three-fourths mile to Arroyo del Hambre, which discharges to Suisun Bay. Concord and Carquinez sheets.

Franklin Creek; Salinas River basin; San Luis Obispo County; rises in the southeastern part of T. 26 S., R. 9 E., Mount Diablo base and meridian; flows northward to Sierra River (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 8 miles; tributary, Cabin Creek. Land Office map of California, 1907.

Frazier Creek; Santa Clara River basin; Ventura County; an intermittent stream, about 2 miles long, rising in the southwestern part of T. 7 N., R. 19 W., San Bernardino base and meridian, and flowing northeastward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 3,200 feet. Tejon sheet.

Freezeout Creek; Sonoma County; rises in the northern part of Bodega Rancho, 1 mile west of Tyrone; flows north of west 2 miles into Russian River (tributary to the Pacific). Punnett's map of Sonoma County.

French Creek; Klamath River basin; Siskiyou County; rises in the northeastern part of T. 40 N., R. 10 W., Mount Diablo base and meridian, on the northwest slope of Mount of the Cross; flows northeastward to its junction with Scott River (tributary to Klamath River, which discharges to the Pacific); length, 9 miles; principal tributary, Miners Creek. Punnett's map of Siskiyou County.

French Creek; Klamath River basin; Siskiyou County; rises in the southeastern part of T. 45 N., R. 9 W., Mount Diablo base and meridian; flows southwestward to its junction with Indian Creek (tributary to Scott River and thus through Klamath River to the Pacific); length, 2 miles. Punnett's map of Siskiyou County.

French Creek; Klamath River basin; Trinity County; rises in the extreme southwestern part of T. 36 N., R. 12 W., Mount Diablo base and meridian; flows west of south to the southwestern part of T. 5 N., R. 8 E., Humboldt base and meridian, where it enters Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 10 miles. Punnett's map of Trinity County.

French Creek, Little; Trinity County; rises in the northern part of T. 34 N., R. 12 W., Mount Diablo base and meridian; flows southwestward 5 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

French Lake; San Diego County; an intermittent water body through which Alamo River passes to Salton Sea; altitude, somewhat more than 122 feet below sea level. Holtville sheet.

Frenchman Creek; San Mateo County; rises in the northwestern part of T. 5 S., R. 5 W., Mount Diablo base and meridian, on the west slope of the Montara Mountains, at altitude 1,800 feet above sea level; flows southwestward and enters the Pacific in Halfmoon Bay; length, about 4 miles; principal tributary, Lock Creek. San Mateo and Santa Cruz sheets.

Freshwater Gulch, Freshwater Slough. *See* Freshwater Creek.

Freshwater Creek; Humboldt County; rises in the north-central part of T. 4 N., R 2 E., Humboldt base and meridian; flows in general somewhat south of west 5 miles, then northwestward into Humboldt Bay; length, about 13 miles. Land Office map of California, 1907. Called Freshwater Gulch in upper portion and Freshwater Slough in lower portion on Punnett's map of Humboldt County.

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Fresno Canyon Creek; Salinas River basin; Monterey County; rises in the northwestern part of T. 18 S., R. 5 E., Mount Diablo base and meridian; flows southeastward into Arroyo Seco (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 10 miles. Land Office map of California, 1907.

Fresno Canyon Creek; Ventura River basin; Ventura County. an intermittent stream, 2½ miles long, rising on the south slope of Sulphur Mountain and flowing southwestward into Ventura River (tributary to the Pacific) near Casitas Station. Ventura sheet.

Fritz Creek; Klamath County, Oreg.; rises in the eastern part of the county and flows southwestward 3 miles into South Fork of Sprague River (tributary through Sprague River to Williamson River, and thus through Upper Klamath Lake to Klamath River, which discharges to the Pacific). Klamath sheet.

Frost Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends southward from Montezuma Creek across Grizzly Island to Grizzly Slough. Antioch sheet.

Fryingpan Canyon Creek; Mono County; rises in the southeastern part of T. 7 N., R. 24 E., Mount Diablo base and meridian, at altitude 10,900 feet above sea level; flows in general somewhat north of east to its junction with East Walker River (tributary to Walker River, which discharges to Walker Lake); length, about 7 miles; fall, 4,900 feet. Bridgeport sheet.

Fuller Creek; Gualala River basin; Sonoma County; rises in the northeastern part of T. 10 N., R. 13 W.; flows southwestward 5 miles, then southward 3 miles into Wheatfield Fork of Gualala River (tributary through Gualala River to the Pacific). Punnett's map of Sonoma County.

Fuller Creek; Owens River basin; Inyo County; Inyo National Forest; rises on the east slope of the Sierra, at altitude 8,800 feet above sea level; flows south of east 3½ miles to its junction with Tinemaha Creek (tributary to Owens River); fall, 3,500 feet. Bishop sheet.

Furnace Canyon Creek; San Bernardino County; T. 3 N., R. 1. E., San Bernardino base and meridian; an intermittent stream, 3 miles long, flowing northward into Mohave Desert. San Gorgonio sheet.

Fusier Canyon Creek; Los Angeles County; an intermittent stream, 1 mile long, flowing southward to Tujunga Canyon (tributary to Los Angeles River, which discharges to the Pacific) near Hoyt ranch. Tujunga sheet.

Gabilan Creek; Monterey County; rises in the eastern part of T. 14 S., R. 4 E., Mount Diablo base and meridian; flows northwestward about 7 miles, then west of south into the marshy area in Salinas Valley (drained by Salinas River, which discharges to the Pacific) northeast of the city of Salinas; length, about 15 miles. Map of Salinas Valley, sheet 1; Land Office map of California, 1907, on which it is shown but not named.

Gabino Canyon Creek; Orange County; rises in extreme southwestern part of Riverside County 1 mile north of the San Diego County line and 1½ miles east of the Orange County line, at altitude 1,700 feet above sea level; flows southwesterly 7 miles into Cristianitos Canyon Creek, which discharges into San Mateo Creek (tributary to the Pacific); fall, 1,450 feet. Elsinore and Capistrano sheets.

Gable Creek; Inyo County; Inyo National Forest; rises on the eastern slope of the Sierra, on north slope of Four Gables, at altitude about 12,000 feet above sea level; flows east and north 4 miles to its junction with Pine Creek (tributary to Rock Creek, which discharges through Owens River to Owens Lake); fall, 4,700 feet. Mount Goddard sheet.

Gacho Creek. *See* Glicko Creek.

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Galloway Creek; Mendocino and Sonoma counties; rises in the northwestern part of T. 11 N., R. 13 W., Mount Diablo base and meridian; flows southeastward 2½ miles, then somewhat north of east 4 miles to its junction with Dry Creek (tributary through Russian River to the Pacific) at Hot Springs. Punnett's map of Mendocino County.

Garapito Creek; Los Angeles County; an intermittent stream, 4 miles long, draining a small area in the Santa Monica Mountains and flowing southwestward into Topanga Canyon Creek, which discharges to the Pacific Ocean. Calabasas sheet.

Garcia River; Mendocino County; rises in the central part of T. 12 N., R. 13 W., Mount Diablo base and meridian; flows northwestward 12 miles to the northeastern part of T. 12 N., R. 15 W., southwestward 8 miles, then northwestward and westward to the southern part of T. 13 N., R. 17 W., where it enters the Pacific just east of Point Arena; length, including major windings, 32 miles; receives many small tributaries but none are named on the map. Punnett's map of Mendocino County.

Garden Gulch Creek; Trinity County; rises in the eastern part of T. 34 N., R. 10 W., Mount Diablo base and meridian; flows somewhat east of south to its junction with West Weaver Creek (tributary through Weaver Creek to Trinity River and thus to Klamath River, which discharges to the Pacific); length, about 4 miles. Punnett's map of Trinity County.

Garlic Dry Lake; San Bernardino County; T. 14 N., R. 3 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I and p. 61, on which Garlic Spring is described.

Garrapatos Creek; Monterey County; a stream, about 5 miles long, rising in the south-central part of T. 17 S., R. 1 E., Mount Diablo base and meridian, and flowing southwestward into the Pacific about halfway between Point Carmelo and Point Sur. Land Office map of California, 1907.

Garzas Creek; Monterey County; rises in the eastern part of T. 17 S., R. 1 E., Mount Diablo base and meridian; flows northeastward into Carmelo River, which discharges to the Pacific in Carmelo Bay; length, about 6 miles. Land Office map of California, 1907.

Gasper Creek; Santa Barbara County; an intermittent stream, about 2¼ miles long, flowing west of south into Jalama Creek (tributary to the Pacific) in the western part of San Julian Rancho. Lompoc sheet.

Gato Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, 1 mile southeast of Santa Ynez Peak, at altitude 2,250 feet above sea level; flows west of south to the point at which it enters the Pacific, 1½ miles northwest of Naples; length, 5 miles. Goleta special sheet.

Gaviota Creek; Salinas River basin; Monterey County; rises in the western part of T. 22 S., R. 13 E., Mount Diablo base and meridian; flows northwestward 6 miles, then southwestward 15 miles to San Ardo, where it joins Salinas River (tributary to the Pacific in Monterey Bay). Land Office map of California, 1907.

Gaviota Creek; Santa Barbara County; an intermittent stream, 5 miles long, flowing southward, and entering the Pacific at Gaviota. Lompoc sheet.

Gavin Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising in the eastern part of T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing northwestward to Wiley Canyon Creek, which discharges toward Santa Clara River (tributary to the Pacific) between Placerita and Pico Canyon creeks; principal tributary, East Canyon Creek. Santa Susana sheet.

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Gazos Creek; San Mateo County; rises in the southeastern part of T. 8 S., R. 4 W., Mount Diablo base and meridian, just west of Hollow Tree Camp, at altitude 1,500 feet above sea level; flows southwestward into the Pacific 1 mile north of Franklin Point; length, about 9 miles; tributary, Old Womans Creek. Santa Cruz sheet.

Gem Lake; Mono County; Mono National Forest; southwestern part of T. 2 S., R. 26 E., Mount Diablo base and meridian; inlet, Rush Creek, which discharges to Mono Lake; altitude, 9,030 feet; affords good storage site. Mount Lyell sheet.

General Creek; Eldorado County; rises in the eastern part of T. 13 N., R. 16 E., Mount Diablo base and meridian, at altitude 8,700 feet above sea level; flows northwestward 3 miles, then northeastward 5½ miles to the point at which it enters Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); fall, 2,475 feet. Pyramid Peak and Truckee sheets.

George Creek; Inyo County; rises on the east slope of the Sierra, 1 mile northeast of Mount Barnard, at altitude 12,500 feet above sea level; flows northeastward about 12 miles to the edge of Owens Valley where its waters sink; fall, 8,600 feet, of which 6,500 feet is made in the first 5 miles. Gaging station near Thebe, 1906–1911. Mount Whitney sheet.

German Canyon Creek; Los Angeles County; an intermittent stream, 1 mile long, rising in the northeastern part of T. 3 N., R. 15 W., San Bernardino base and meridian, and flowing northeastward into Sand Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific). Fernando sheet.

Gibbs Canyon Creek; Mono County; Mono National Forest; rises in the southern part of T. 1 N., R. 25 E., Mount Diablo base and meridian, on the north slope of Mount Gibbs, at altitude 11,500 feet above sea level; flows northeastward into Mono Lake; length, about 8 miles; fall, about 5,100 feet, of which 2,000 feet is made in the first mile; at the lower end of the canyon is a channel, about 1 mile long, leading northward to Leevining Creek; head of channel is marked as an intermittent watercourse. Mount Lyell sheet.

Gibson Creek; Mendocino County; rises in the central part of T. 15 N., R. 13 W., Mount Diablo base and meridian; flows eastward into Russian River; length, about 6 miles; passes through Ukiah. Punnett's map of Mendocino County.

Gilbert Creek; Del Norte County; rises in the northern part of T. 18 N., R. 1 W., Humboldt base and meridian; flows northwestward to the point at which it enters the Pacific, 2 miles north of the mouth of Smith River; length, about 2 miles. Punnett's map of Del Norte County.

Gilman Lake; Mono County; southeastern part of T. 3 N., R. 24 E., Mount Diablo base and meridian; inlet, East Fork of Green Creek; outlet, East Fork of Green to Green Creek (tributary to Virginia Creek and thus through East Walker River to Walker River, which discharges to Walker Lake); altitude, 9,450 feet. Bridgeport sheet.

Gilmore Lake; Eldorado County; north-central part of T. 12 N., R. 17 E., Mount Diablo base and meridian, 1 mile southwest of Mount Tallac; outlet, a stream, 1½ miles long, flowing southwestward to the stream connecting Suzy Lake with Fallen Leaf Lake (outlet through Lake Tahoe, Truckee River, and to Pyramid and Winnemucca lakes); altitude, 8,350 feet. Pyramid Peak sheet.

Glacier Canyon Creek; Mono County; Mono National Forest; rises in the southern part of T. 1 N., R. 25 E., Mount Diablo base and meridian, in a glacier on the north slope of Mount Dana (altitude, 13,050 feet); flows northwestward to Tioga Lake, then northward into Leevining Creek (tributary to Mono Lake); length, about 3 miles; fall, 2,500 feet. Mount Lyell sheet.

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Glass Creek; Mono County; rises in the southern part of T. 2 S., R. 26 E., Mount Diablo base and meridian; flows northeastward to Owens River; shown on Mount Lyell sheet; shown but not named on the Land Office map of California, 1907.

Glen Anne Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 1,400 feet above sea level; flows west of south 2½ miles, then east of south 2 miles to Coromar, where its waters sink before reaching the marsh through which this part of Santa Barbara County is drained to the Pacific. Goleta special sheet.

Glicko Creek; Monterey County; rises in the northern part of T. 19 S., R. 4 E., Mount Diablo base and meridian; flows northwestward and joins Carmelo River (tributary to the Pacific in Carmelo Bay) near Carmel; length, about 18 miles; principal tributaries, Carmelocitos River and San Clemeute Creek. Land Office map of California, 1907.

Gobernador Creek; Santa Barbara County; formed in T. 4 N., R. 25 W., by the union of Eldorado and Steer creeks. Steer Creek, which drains the larger area and is considered the continuation of the main stream, rises in the southeastern part of T. 5 N., R. 25 W., San Bernardino base and meridian, at altitude 3,750 feet above sea level, and flows west of south to the junction with Eldorado Creek; below this junction Gobernador Creek flows southeastward 1½ miles, then southwestward 1½ miles to Carpinteria Creek (tributary to the Pacific); length to head of Steer Creek, 7 miles. Ventura sheet.

Gold Canyon Creek; Los Angeles County; Los Angeles River basin; rises in the Angeles National Forest, 2 miles north of the north line of T. 2 N., R. 13 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows southeastward 1½ miles, then southwestward half a mile into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); fall, 1,700 feet. Tujunga sheet.

Gold Creek; Los Angeles County; rises in the Angeles National Forest, at altitude 4,750 feet above sea level; flows southwestward 4 miles into Little Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); fall, 3,150 feet. Fernando sheet.

Golden Canyon Creek; Alpine County; rises in the western part of T. 7 N., R. 21 E., Mount Diablo base and meridian, on the east slope of Disaster Peak, at altitude 9,100 feet above sea level; flows northeastward and discharges into East Fork Carson River (tributary through Carson River to Carson Sink); length, 4 miles; fall, 2,100 feet. Dardanelles sheet.

Gold Run Creek; Lassen County; rises in the southern part of T. 29 N., R. 11 E., Mount Diablo base and meridian, at altitude 5,000 feet above sea level; flows northeastward 7 miles into Susan River (tributary to Honey Lake); fall, 900 feet. Honey Lake sheet.

Goodale Creek; Inyo County, Inyo National Forest; rises in the triangular area between Mount Pinchot, Striped Mountain, and Goodale Mountain, in a small lake at altitude 11,100 feet above sea level; flows in general northeastward 7 miles, then southeastward to Owens Valley near Hines Spring, where its water sinks; fall, 7,250 feet; gaging station near Aberdeen (1906–1911). Mount Whitney sheet.

Goode Canyon Creek; Santa Barbara County; an intermittent stream, 3 miles long, rising in the western part of T. 9 N., R. 25 W., San Bernardino base and meridian, and flowing northward toward Cuyama River (Santa Maria River, tributary to the Pacific Ocean). Santa Ynez sheet.

Goodyear Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends southwestward from the junction of Cordelia Slough and Suisun Slough. Napa sheet.

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Goose Creek; Del Norte County; rises in the eastern part of T. 13 N., R. 2 E., Humboldt base and meridian; flows west of north 6 miles, then east of north 7 miles to its junction with South Fork of Smith River (tributary to Smith River, which flows to the Pacific). Punnett's map of Del Norte County.

Goose Lake; Humboldt County; central part of T. 2 N., R. 1 E., Humboldt base and meridian; outlet, a stream 1½ miles long, flowing southward to Van Duzen River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Gopher Canyon Creek; San Diego County; rises in the central part of T. 11 S., R. 3 W., San Bernardino base and meridian, at altitude 900 feet above sea level; flows northwestward 5 miles into San Luis Rey River (tributary to the Pacific); fall, about 750 feet; intermittent. San Luis Rey sheet.

Gorton Creek; Del Norte County; rises in the eastern part of T. 16 N., R. 2 E., Humboldt base and meridian; flows southwestward into South Fork of Smith River (tributary to Smith River, which flows to the Pacific); length, about 5 miles. Punnett's map of Del Norte County.

Graciosa Canyon; Santa Barbara County; extends northward from Graciosa Ridge toward Santa Maria Valley. Lompoc sheet.

Graham Creek; Sonoma County; rises in the western part of T. 6 N., R. 6 W., Mount Diablo base and meridian; flows northeastward 3 miles to Glen Ellen, then southeastward 1 mile into Sonoma Creek (tributary to Napa River, which discharges to San Pablo Bay). Punnett's map of Sonoma County.

Graham Gulch Creek; Siskiyou County; in the central part of T. 39 N., R. 12 W., Mount Diablo base and meridian; flows southwestward 3 miles into Salmon River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Grant Lake; Mono County; T. 1 S., R. 26 E., Mount Diablo base and meridian; inlet, Rush Creek; outlet, Rush Creek in Mono Lake; altitude, 7,060 feet; fall of Rush Creek in the 6 miles below Grant Lake, 660 feet. Mount Lyell sheet.

Grapevine Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream rising in the western part of T. 3 N., R. 15 W., San Bernardino base and meridian, and flowing southward into San Fernando Valley. Fernando and Santa Monica sheets.

Grapevine Canyon Creek; San Bernardino County; Tps. 3 and 4 N., R. 2 W.; an intermittent stream, 4 miles long, flowing northward to the Mohave Desert. Deep Creek sheet.

Grapevine Creek; Eel River basin; Mendocino County; rises in the southeastern part of T. 23 N., R. 15 W., Mount Diablo base and meridian; flows southwestward 2½ miles into Rattlesnake Creek (tributary through South Fork of Eel River to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Grapevine Creek; Mohave Desert; San Bernardino County; T. 3 N., R 2 E., San Bernardino base and meridian; an intermittent stream rising in Cactus Flat and flowing northeastward toward the Mohave Desert. San Gorgonio sheet.

Grapevine Creek; Riverside County; an intermittent stream rising on the north slope of Asbestos Mountain and flowing northeastward to Dead Indian Creek, which discharges to Coachella Valley. Indio special sheet.

Grapevine Creek; Tia Juana River basin; San Diego County; rises in the northeastern part of T. 18 S., R. 3 E., San Bernardino base and meridian, at altitude 2,600 feet above sea level; flows west of south 3 miles into Potrero Creek (tributary through Cottonwood Creek to Tia Juana River, which discharges to the Pacific); fall 1,100 feet; intermittent. Cuyamaca sheet.

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Grass Creek; Alameda County; rises on the western slope of San Leandro Hills, at altitude 1,000 feet above sea level; flows in general southeastward into Lake Chabot, which discharges through San Leandro Creek to San Leandro and San Francisco bays; fall, 765 feet. Concord and Haywards sheets.

Grasshopper Creek; Sonoma County; rises in the northern part of T. 10 N., R. 13 W., Mount Diablo base and meridian; flows south of west 4 miles, then northward 1 mile into Buckeye Creek, through which it is tributary to Gualala River (tributary to the Pacific). Punnett's map of Sonoma County.

Grass Valley Creek; Klamath River basin; Trinity County; rises in the southern part of T. 32 N., R. 8 W., Mount Diablo base and meridian; flows northwestward to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 10 miles; principal tributary, Little Grass Valley Creek. Punnett's map of Trinity County.

Grass Valley Creek; Mohave River basin; San Bernardino County; rises in the western part of T. 2 N., R. 3 W., San Bernardino base and meridian, on the north slope of Strawberry Peak, at altitude 5,750 feet above sea level; flows eastward, northward, and northwestward to the central part of T. 3 N., R. 4 W., where it spreads into several channels and joins the West Fork of Mohave River; length, about 9 miles; fall, 2,650 feet. Redlands, Deep Creek, and Hesperia sheets.

Grass Valley Creek, Little; Trinity County; rises in the eastern part of T. 32 N., R. 8 W., Mount Diablo base and meridian, on the west slope of Mount Bally; flows northwestward 6 miles to its junction with Grass Valley Creek (tributary to Trinity River and thus to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Graves Creek; San Luis Obispo County; rises in the southwestern part of T. 28 S., R. 12 W., Mount Diablo base and meridian; flows northward into Salinas River (tributary to the Pacific Ocean) near Templeton; about 5 miles long. Land Office map of California, 1907.

Graveyard Canyon Creek; Los Angeles County; rises in the northeastern part of T. 2 N., R. 9 W., San Bernardino base and meridian, on the west slope of Rattlesnake Peak, at altitude 4,850 feet above sea level; flows southwestward 3½ miles into San Gabriel River (tributary to the Pacific); fall, 3,350 feet; intermittent. Rock Creek and Pomona sheets.

Grayson Creek; Walnut Creek basin; Contra Costa County; rises in Canada del Hambre Rancho, in the Briones Hills, at altitude 800 feet above sea level; flows northeastward 3½ miles, then almost due north 2 miles to a point near Pacheco, where it joins Walnut Creek (tributary to Suisun Bay); fall, 775 feet. Concord sheet.

Green Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 6 miles long, rising in the southwestern part of T. 10 N., R. 27 W., San Bernardino base and meridian, and flowing northward to Cuyama River (Santa Maria River, tributary to the Pacific). Santa Ynez sheet.

Green Creek; Mono County; formed in the eastern part of T. 3 N., R. 24 E., Mount Diablo base and meridian, by the junction of its East and West forks. The West Fork, which drains the larger area and is therefore considered the continuation of the main stream, heads in a number of small lakes in the southern part of T. 3 N., R. 24 E.; flows northeastward; below the forks Green Creek flows northeastward 5 miles, then west of north 5 miles to the northwestern part of T. 4 N., R. 25 E., where it unites with Virginia Creek to form East Walker River (tributary to Walker River, which discharges to Walker Lake); length to head of West Fork, about 15 miles; fall, 4,500 feet, of which 2,000 feet is made in the 2 miles above Green Lake. Bridgeport sheet.

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Green Creek, East Fork; Mono County; rises in the northern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, in Summit Lake, at altitude 10,203 feet; flows northeastward 1½ miles, then northward 2½ miles to Green Creek (tributary through Virginia Creek to East Walker River, and thus to Walker River, which discharges to Walker Lake); fall above junction with West Fork, 1,900 feet; passes through Hoover, Gilman, and Red Lakes. Bridgeport sheet.

Greenhorn Creek; Siskiyou County; rises in the southeastern part of T. 45 N., R. 8 W., Mount Diablo base and meridian; flows in general eastward 5 miles into Yreka Creek (tributary through Shasta River to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Green Lake; Owens River basin; Inyo County; Inyo National Forest; eastern part of T. 9 S., R. 31 E., Mount Diablo base and meridian; one inlet; outlet, a stream, 1½ miles long, flowing northwestward into South Fork of Bishop Creek (tributary through Bishop Creek to Owens River, which discharges to Owens Lake); altitude, 11,100 feet; fall of outlet, about 1,700 feet. Mount Goddard sheet.

Green Lake; Walker River basin; Mono County; southeastern part of T. 3 N., R. 24 E., Mount Diablo base and meridian; inlets from Par Value and West lakes; outlet, West Fork of Green Creek (tributary to Virginia Creek, and thus through East Walker River to Walker River, which discharges to Walker Lake); altitude, 8,950 feet. Bridgeport sheet.

Greenlead Creek; San Bernardino County; rises in the southeastern part of T. 3 N., R. 1 W., San Bernardino base and meridian, at altitude 7,500 feet above sea level; flows southwestward 2 miles into Holcomb Creek (tributary to Deep Creek, which discharges to Mohave River); fall, 900 feet. San Gorgonio sheet.

Greenoaks Creek; Santa Cruz and San Mateo counties; an intermittent stream, 2 miles long, flowing toward the coast in Punto del Año Nuevo Rancho; sinks in the sands northeast of Año Nuevo Point. Santa Cruz sheet.

Green Valley Creek; Mohave River basin; San Bernardino County; rises in the eastern part of T. 2 N., R. 2 W., San Bernardino base and meridian, in Green Valley, at altitude about 7,400 feet above sea level; flows southwestward 3 miles into Deep Creek (tributary to Mohave River); fall, 1,950 feet. Redlands sheet.

Green Valley Creek; Russian River basin; Sonoma County; rises in the northeastern part of T. 6 N., R. 9 W., Mount Diablo base and meridian; flows east of north 3 miles, then west of north 8 miles to its junction with Russian River (tributary to the Pacific). Punnett's map of Sonoma County.

Green Valley Creek; Solano County; rises in the northwestern part of T. 5 N., R. 3 W., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows east of south 7 miles into Cordelia Slough, through which it enters Suisun Creek and Bay. Napa sheet.

Green Valley Creek; Walnut Creek basin; Contra Costa County; rises in the eastern part of T. 1 S., R. 1 W., Mount Diablo base and meridian, on the south slope of the Black Hills, at altitude about 850 feet above sea level; flows irregularly westward into San Ramon Creek (Walnut Creek, tributary through Pacheco Creek to San Francisco Bay) at Danville; length, about 5 miles. Mount Diablo sheet.

Greenwood Creek; Mendocino County; rises in the southern part of T. 14 N., R. 15 W., Mount Diablo base and meridian, flows northwestward, and enters the Pacific near the town of Elk; length, 14 miles; called also Donahue Creek. Punnett's map of Mendocino County.

Griders Creek; Siskiyou County; rises in the central part of T. 44 N., R. 12 W., Mount Diablo base and meridian, on the west slope of Marble Mountains;

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flows in general somewhat east of north about 14 miles to its junction with Klamath River (tributary to the Pacific) at Griders. Punnett's map of Siskiyou County.

Gridley Canyon Creek; Ventura County; rises in the western part of T. 5 N., R. 22 W., San Bernardino base and meridian, on east slope of Nordhoff Peak, at altitude 2,750 feet above sea level; flows southeastward into San Antonio Creek (tributary to Ventura River, which discharges to the Pacific) at mouth of Senor Canyon; length, about 3 miles; fall, 1,700 feet. Santa Paula sheet.

Grimes Canyon Creek; Ventura County; an intermittent stream rising on the north slope of Oak Ridge, in T. 3 N., R. 19 W., San Bernardino base and meridian, and flowing northwestward toward Santa Clara River (tributary to the Pacific) at Bardsdale. Camulos sheet.

Grizzly Creek; Coyote River basin; Santa Clara County; an intermittent stream draining a small area in the eastern part of T. 8 S., R. 4 E., Mount Diablo base and meridian; tributary to Coyote River (tributary to San Francisco Bay) near its head. Mount Hamilton sheet.

Grizzly Creek; Klamath River basin; Trinity County; rises in the northeastern part of T. 36 N., R. 11 W., Mount Diablo base and meridian; flows westward into the northeastern part of T. 36 N., R. 12 W., where it enters the North Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, about 6 miles. Punnett's map of Trinity County.

Grizzly Creek; Walnut Creek basin; Contra Costa County; rises in the southern part of T. 1 S., R. 2 W., Mount Diablo base and meridian, north of Las Trampas Peak, at altitude 1,500 feet above sea level; flows northwestward 3 miles into Lafayette Branch of Walnut Creek (tributary through Walnut Creek to Suisun Bay); fall, 1,125 feet. Concord sheet.

Grizzly Gulch Creek; Humboldt County; rises in the central part of T. 2 N., R. 3 E., Humboldt base and meridian, 1 mile south of Yagerville; flows southwestward into Van Duzen River (tributary to Eel River, which flows into the Pacific); length, 6 miles. Punnett's map of Humboldt County.

Grizzly Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends northwestward from Montezuma Slough between Grizzly and Hammond Islands. Antioch sheet.

Grouse Creek; Klamath River basin; Humboldt County; rises in the central part of T. 4 N., R. 5 E., Humboldt base and meridian; flows north of east 5 miles into South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Humboldt County.

Grouse Creek; Klamath River basin; Siskiyou County; rises in the central part of T. 48 N., R. 8 W.; flows southwestward 2 miles into Beaver Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Grout Creek; San Bernardino County; rises in the central part of T. 2 N., R. 1 W., San Bernardino base and meridian, at altitude 7,800 feet above sea level; flows northeastward 2 miles, then eastward about 1 mile toward Bear Lake (outlet through Bear Creek to Santa Ana River, which discharges to the Pacific); fall, 1,000 feet. San Gorgonio sheet.

Guadalupe Creek; Riverside County; an intermittent stream, 3 miles long, flowing northeastward to Devil Canyon, which discharges to the Colorado Desert. Indio special sheet.

Guadalupe River; Santa Clara County; rises in T. 9 S., R. 1 E., Mount Diablo base and meridian; flows in general west of north to Alviso, where it passes through Guadalupe Slough to San Francisco Bay; passes through the

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city of San Jose; principal tributaries, Cincas and Los Gatos creeks. San Jose sheet; Land Office map of California, 1907.

Guadalupe Slough; Santa Clara County; in the tidal marsh in the southern end of San Francisco Bay; the channel through which Guadalupe River enters the bay. Palo Alto and San Jose sheets.

Guadalupe Valley Creek; San Mateo County; rises on the northeastern slope of San Bruno Mountain in Canada de Guadalupe de Visitacion Rancho, at altitude 600 feet above sea level; flows southeastward into San Francisco Bay north of Visitation Point; length, about 2 miles; intermittent. San Mateo sheet.

Gualala River; Sonoma and Mendocino counties; formed in Sonoma County in the central part of T. 10 N., R. 14 W., Mount Diablo base and meridian, by the junction of South Fork and Wheatfield Fork. The Wheatfield Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the eastern part of T. 9 N., R. 13 W., and takes a general northwesterly course to the point at which it receives the South Fork. Below these forks the Gualala continues to flow northwestward to the southeastern part of T. 11 N., R. 15 W., where it receives the North Fork, turns abruptly to the southwest, and enters the Pacific near the town of Gualala. Above its junction with the South Fork the Wheatfield Fork receives as its principal tributary the Middle Fork of the Gualala, a stream draining a much larger area than Wheatfield Fork proper. Below the mouth of Wheatfield Fork the principal tributaries of the Gualala are Buckeye and Rock Pile creeks and North Fork of Gualala. Punnett's maps of Sonoma and Mendocino counties.

Gualala River, Middle Fork; Sonoma County; rises in the eastern part of T. 10 N., R. 12 W., Mount Diablo base and meridian; flows westward 5 miles, very irregularly southward 4 miles, then winds to the west, northwest, and southwest, and unites with the Wheatfield Fork of Gualala River (through which it is tributary to Gualala and to the Pacific) in the southern part of T. 10 N., R. 13 W.; length, including major windings, 17 miles; principal tributaries, North Fork of Gualala and Wolf Creek, and South Middle Fork of Gualala. Punnett's map of Sonoma County.

Gualala River, Middle Fork, South; Sonoma County; rises in the eastern part of T. 9 N., R. 12 W., Mount Diablo base and meridian; flows very irregularly westward and northward to its junction with Middle Fork of Gualala River (tributary through Wheatfield Fork to Gualala River, and thus to the Pacific); length, including major windings, 10 miles; tributaries unnamed. Punnett's map of Sonoma County.

Gualala River, North Fork [of Middle Fork]; Sonoma County; rises in the southern part of T. 11 N., R. 12 W., Mount Diablo base and meridian; flows westward 3 miles, southeastward 1 mile, then west, southwest, and south to its junction with Middle Fork Gualala (tributary through Wheatfield Fork to Gualala River and thus to the Pacific) in the western part of T. 10 N., R. 12 W.; length, including major windings, 10 miles; tributaries unnamed. Punnett's map of Sonoma County.

Gualala River, North Fork; Mendocino County; rises in the southwestern part of T. 12 N., R. 13 W., Mount Diablo base and meridian; flows very irregularly southwestward to the southeastern part of T. 11 N., R. 15 W., where it turns sharply and flows southeastward to its junction with Gualala River (tributary to the Pacific); length, including major windings, 14 miles; principal tributaries, Spring Branch and Billings Creek. Punnett's map of Mendocino County.

Gualala River, South Fork; Sonoma County; rises in the northeastern part of T. 8 N., R. 12 W., Mount Diablo base and meridian; flows southward 2 miles,

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then northwestward 18 miles to the central part of T. 10 N., R. 14 W., where it unites with Wheatfield Fork to form Gualala River (tributary to the Pacific). In the southeastern part of T. 9 N., R. 13 W., this fork of the Gualala receives an unnamed fork formed by many short branching tributaries. Punnett's map of Sonoma County.

Gualala River, Wheatfield Fork. *See* Gualala River.

Guatay Creek; San Diego County; rises in the southeastern part of the Cuyamaca grant, at altitude 4,800 feet above sea level; flows southward and southwestward to its junction with Sweetwater River (tributary to the Pacific through San Diego Bay) in Descanso Valley, about 2 miles above the gaging station at Descanso; length, about 6 miles; fall, 1,400 feet; intermittent. Shown but not named on the Cuyamaca sheet.

Guaya Canyon Creek; San Luis Obispo County; an intermittent stream, about 2 miles long, rising in T. 32 S., R. 14 E., Mount Diablo base and meridian, and flowing westward to Newsom Canyon, which discharges to Arroyo Grande Valley (drained by Arroyo Grande Creek, which discharges to the Pacific). Arroyo Grande sheet.

Guiberson Canyon Creek; Ventura County; an intermittent stream, 2 miles long, rising on the north slope of Oak Ridge and flowing northwestward to Santa Clara River (tributary to the Pacific). Camulos sheet.

Gull Lake; Mono County, Mono National Forest; east-central part of T. 2 S., R. 26 E., Mount Diablo base and meridian; inlet, Reversed Creek, which enters from June Lake; outlet, Reversed Creek to Rush Creek, which discharges to Mono Lake; altitude, about 7,625 feet. Mount Lyell sheet.

Guthrie Creek; Humboldt County; rises in the southeastern part of T. 2 N., R. 2 W., Humboldt base and meridian; flows northwestward, and enters the Pacific 7 miles southwest of the mouth of Eel River (tributary to the Pacific); length, 6 miles. Punnett's map of Humboldt County.

Gwin Gulch Creek; Trinity County; rises in the west-central part of T. 34 N., R. 10 W., Mount Diablo base and meridian; flows northwestward 1 mile and south of west 2 miles into Canon Creek (tributary to Trinity River and thus to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Gypsum Canyon Creek; Riverside County; an intermittent stream, 3 miles long, flowing northeastward to Eagle Canyon Creek and then northward into Temescal Wash (tributary to Santa Ana River, which discharges to the Pacific) south of Corona. Corona sheet.

Hagador Canyon Creek; Riverside County, an intermittent stream, 4 miles long, flowing northward to Temescal Wash (tributary to Santa Ana River, which discharges to the Pacific) southwest of Corona; tributary, Tin Mine Canyon Creek. Corona sheet.

Haines Canyon; Ventura County; a drainage way opening southward to Santa Clara River (tributary to the Pacific) in the northern part of T. 4 N., R. 19 W., San Bernardino base and meridian. Camulos sheet.

Haiwee Creek; Inyo County; rises on the east slope of the Sierra, in the eastern part of T. 21 S., R. 36 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows north and east of north to the region south of Owens Lake, where its waters sink; length, about 5 miles; fall, 3,500 feet. Olancha sheet.

Half Moon Lake; Eldorado County; northwestern part of T. 12 N., R. 17 E., Mount Diablo base and meridian, half a mile southeast of Dicks Peak; 2 small, inflowing streams; outlet, a stream, 1 mile long, flowing southeastward to Suzy

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Lake (outlet to Fallen Leaf Lake, which discharges to Lake Tahoe); altitude. 8,150 feet; above Suzy Lake, 400 feet. Pyramid Peak sheet.

Hall Canyon Creek; Ventura County; an intermittent stream, 5 miles long. rising in the western part of T. 3 N., R. 22 W., and flowing southwestward to the Pacific Ocean, just south of the city of Ventura; fall, 1,000 feet. Santa Paula and Ventura sheets.

Halloran Wash; San Bernardino County; Tps. 14 and 15 N., Rs. 9 and 10 E., San Bernardino base and meridian; a desert drainage way extending southwestward from a point near Halloran Springs. Ivanpah sheet.

Halls Creek; Trinity County; rises in the southwestern part of T. 37 N., R. 6 W., Mount Diablo base and meridian, at altitude 5,400 feet above sea level; flows south of west to its junction with East Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 2½ miles; fall, 3,100 feet. Shasta sheet.

Hammond Canyon Creek; Ventura County; rises on the southern slope of Sulphur Mountain at altitude 1,500 feet above sea level; flows southwestward into Canada Larga (tributary to Ventura River, which discharges to the Pacific); length, about 4 miles; fall, 950 feet; tributary, Sulphur Canyon Creek. Santa Paula sheet.

Hampton Canyon Creek; Ventura County; an intermittent stream, 2 miles long, flowing east of south into Wheeler Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific) in Ex Mission San Buenaventura Rancho. Santa Paula sheet.

Happy Camp Canyon Creek; Ventura County; rises on the south slope of Oak Ridge, about 4 miles south of Camulos, at altitude 2,150 feet above sea level; flows south of west 6 miles, then east of south 4 miles to a point near Moorpark at the east end of Little Simi Valley, where it joins Arroyo Las Posas (Calleguas Creek, which discharges to the Pacific); fall, 1,550 feet; intermittent. Camulos sheet.

Harbison Canyon Creek; San Diego County; rises in the southwestern part of T. 15 S., R. 2 E., San Bernardino base and meridian, at altitude 1,300 feet above sea level; flows southwestward 5 miles into Sweetwater River (tributary to the Pacific through San Diego Bay); fall, 750 feet; intermittent. Cuyamaca sheet.

Harding Canyon Creek; Orange County; rises in the eastern part of T. 5 S., R. 7 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows south of west about 4 miles into Santiago Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 1,600 feet; intermittent. Corona sheet.

Hardscrabble Creek; Mendocino County; rises in the northwestern part of T. 11 N., R. 15 W., Mount Diablo base and meridian; flows southwestward, and enters the Pacific at Signal Port; length, 2½ miles. Punnett's map of Mendocino County.

Hardy Creek; Mendocino County; rises in the central part of T. 22 N., R. 17 W., Mount Diablo base and meridian; flows southwestward and enters the Pacific at Hardy; length, about 3½ miles; several short unnamed tributaries. Punnett's map of Mendocino County.

Hare Creek; Mendocino County; rises in the southeastern part of T. 18 N., R. 17 W., Mount Diablo base and meridian; flows northwestward, and enters the Pacific half a mile south of the mouth of Noyo River; length, 6 miles. Punnett's map of Mendocino County.

Harford Canyon Creek; San Luis Obispo County; an intermittent stream, 2 miles long, draining a small area in San Miguelito Rancho and flowing southward into San Luis Obispo Creek near its entrance to San Luis Obispo Bay. Arroyo Grande sheet.

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Harmon Canyon Creek; Ventura County; rises in the western part of T. 3 N., R. 22 W., San Bernardino base and meridian, at altitude 1,150 feet above sea level; flows southward to Santa Clara River (tributary to the Pacific Ocean); length above the edge of the valley, 3½ miles, in which distance the fall is 750 feet. Santa Paula sheet.

Harrington Creek; San Mateo County; rises in T. 6 S., R. 4 W., Mount Diablo base and meridian, at altitude 1,800 feet above sea level; flows west of south 5 miles into San Gregorio Creek, which discharges to the Pacific; fall, 1,500 feet. Santa Cruz sheet.

Harris Canyon; Santa Barbara County; western part of Los Alamos Rancho; opens southeastward to the upper end of San Antonio Valley (drained by San Antonio Creek, which discharges to the Pacific). Lompoc sheet.

Harrow Canyon; Los Angeles County; a drainage way in the western part of T. 1 N., R. 9 W., San Bernardino base and meridian; carries an intermittent stream, about 1 mile long, toward Big Dalton Canyon (tributary to San Gabriel River, which discharges to the Pacific). Pomona sheet.

Haskell Canyon Creek; Los Angeles County; rises in the Santa Barbara National Forest; flows southward into Deadman Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific), to which it delivers water only in times of flood; intermittent. Santa Susana sheet.

Hasley Canyon Creek; Los Angeles County; rises in the southwestern part of T. 5 N., R. 17 W., in the Santa Barbara National Forest, at altitude about 2,100 feet above sea level; flows southeastward into Castac Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 5 miles; fall, about 1,100 feet. Santa Susana sheet.

Hastings Creek; Contra Costa County; a channel in the tidal marsh south of Suisun Bay. Carquinez sheet.

Hatchet Creek; Trinity County; rises in the southeastern part of T. 37 N., R. 8 W., Mount Diablo base and meridian, at altitude 7,000 feet above sea level; flows southeastward to its junction with Trinity River (tributary through Klamath River, which discharges to the Pacific); length, 5 miles; fall, 4,700 feet, of which 4,000 feet is made in the first 3 miles. Called Natchett Creek on Punnett's map. Shasta sheet.

Hatfield Creek; San Diego County; rises in the northeastern part of T. 13 S., R. 2 E., San Bernardino base and meridian, at altitude 2,900 feet above sea level; flows southwestward through Ballena Valley to the eastern part of T. 13 S., R. 1 E., where it turns and flows northwestward to its junction with Santa Maria Creek (tributary to San Dieguito River); intermittent; length, about 8 miles; fall, 1,400 feet; described by Wm. Ham. Hall[1] as the head of Santa Maria Creek. Ramona sheet.

Hathaway Creek; Riverside County; rises in the northern part of T. 2 S., R. 1 E., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows southward about 5 miles into the western end of San Gorgonio Pass, which slopes eastward from Beaumont toward the Colorado Desert. San Jacinto sheet.

Hathaway Creek; Santa Ana River basin; San Bernardino County; rises in the southern part of T. 1 N., R. 1 E., San Bernardino base and meridian, 2 miles east of San Bernardino Mountain, at altitude 10,000 feet above sea level; flows in general northwestward to its junction with Santa Ana River (tributary to the Pacific) near Seven Oaks; length, about 5 miles; fall, 4,900 feet; intermittent. San Gorgonio sheet.

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[1] Irrigation in [southern] California, Sacramento, 1888, pp. 43, 44.

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Hauser Creek; San Diego County; rises in the southeastern part of T. 17 S., R. 4 E., San Bernardino base and meridian, at altitude about 3,000 feet above sea level; flows northwestward 3 miles into Cottonwood Creek (tributary to Tia Juana River, which discharges to the Pacific) 2 miles southwest of the Morena Dam; fall, 1,000 feet; intermittent. Cuyamaca sheet.

Hayden Gulch Creek; Siskiyou County; rises in the central part of T. 42 N., R. 7 W., Mount Diablo base and meridian; flows southwestward to its junction with East Fork of Scott River (tributary through Scott River to Klamath River, which discharges to the Pacific); length, about 10 miles. Punnett's map of Siskiyou County.

Hayes Creek; Alameda County; an intermittent stream rising in San Antonio Rancho and flowing westward and southward to Oakland, where it enters Lake Merritt. Concord and San Francisco sheets.

Hayfork River; Trinity County; rises in the northeastern part of T. 28 N., R. 11 W., Mount Diablo base and meridian; flows irregularly northward to the southeastern part of T. 31 N., R. 11 W., where it receives its East Fork, and then takes a general northwesterly course to the southeastern part of T. 3 N., R. 6 E., Humboldt base and meridian, where it enters South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, including major windings, about 42 miles; principal tributaries, East Fork, Salt Creek, and Tule Creek; many tributaries unnamed on the map. Punnett's map of Trinity County.

Hayfork River, East Fork; Trinity County; rises in the southern part of T. 31 N., R. 10 W., Mount Diablo base and meridian, on the north slope of Chanchelulla Peak; flows south of west to its junction with Hayfork River (tributary through South Fork of Trinity River to Trinity River and thus to Klamath River, which discharges to the Pacific); length, 5 miles. Punnett's map of Trinity County.

Hayshed Creek; Mendocino County; rises in the central part of T. 22 N., R. 11 W., Mount Diablo base and meridian; takes a general southwesterly course to its junction with Middle Fork of Eel River (tributary to Eel River, which flows to the Pacific); length, 6 miles. Punnett's map of Mendocino County.

Hayworth Creek; Mendocino County; rises in the western part of T. 19 N., R. 14 W., Mount Diablo base and meridian; flows southwestward to the western part of T. 18, N., R. 15 W., where it unites with the Upper South Fork of Noyo River to form the North Fork of Noyo River, the continuation of Noyo River (tributary to the Pacific); length, about 8 miles; receives a number of tributaries unnamed on the map. Punnett's map of Mendocino County.

Hawkins Creek; Trinity County; rises in the southeastern part of T. 7 N., R. 6 E., Humboldt base and meridian; flows west of south into Trinity River (tributary to Klamath River, which discharges to the Pacific); length, about 6 miles. Punnett's map of Trinity County.

Hazard Canyon Creek; San Luis Obispo County; an intermittent stream, about 3 miles long, rising in Canada de los Osos Rancho and flowing westward to the Pacific 1 mile northeast of the mouth of Islay Creek. Cayucos sheet.

Heart Lake; Inyo County; Inyo National Forest, southeast of Kearsarge Pass; outlet, a stream, 2 miles long, flowing north of east through 2 small lakes to its junction with Little Pine Creek (tributary to Owens Valley) in Onion Valley; altitude, 10,850 feet; very small. Mount Whitney sheet.

Heather Lake; Eldorado County; western part of T. 12 N., R. 17 E., Mount Diablo base and meridian; outlet, a stream, 1 mile long, flowing eastward to the stream connecting Suzy Lake with Fallen Leaf Lake (outlet through Lake

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Tahoe to Truckee River, which discharges to Pyramid and Winnemucca Lakes); altitude, 7,850 feet. Pyramid Peak sheet.

Heenan Lake; Alpine County, eastern part; mapped as a marsh; drained by an intermittent stream flowing westward to the East Fork of Carson River (tributary through Carson River to Carson Sink); altitude, about 7,100 feet. Markleeville sheet.

Heins Lake; Salinas River basin; Monterey County; 2½ miles southeast of the city of Salinas; the lake is about 1 mile long and nearly half a mile wide; altitude, 50 feet. Salinas Valley map, sheet 1.

Hemet Reservoir; Riverside County; northwestern part of T. 6 S., R. 3 E., San Bernardino base and meridian, at west end of Hemet Valley on South Fork of San Jacinto River; reservoir is about 1½ miles long and one-fourth mile in maximum width. San Jacinto sheet.

Hemlock Creek; San Bernardino County; rises in the northeastern part of T. 1 N., R. 2 W., San Bernardino base and meridian, on the west slope of Keller Peak, at altitude 7,500 feet above sea level; flows southwestward 1 mile, then somewhat west of south 3 miles to its junction with Santa Ana River (tributary to the Pacific); fall, 5,000 feet, of which 2,600 feet is made in the first mile; principal tributary, Alder Creek. Redlands sheet.

Henry Creek; Santa Cruz County; a stream about 1 mile long, rising in the northeastern part of T. 9 S. R. 4 W. and flowing southeastward to West Waddell Creek (tributary to Waddell Creek, which discharges to the Pacific). Santa Cruz sheet.

Higgins Canyon Creek; Los Angeles County; an intermittent stream, about 2 miles long, draining a small area in the Santa Monica Mountains and flowing southward to its junction with Coldwater Canyon Creek (tributary to Ballona Creek). Santa Monica sheet.

High Creek; San Bernardino County; rises in the northeastern part of T. 1 S., R. 1 E., San Bernardino base and meridian, at altitude 10,500 feet above sea level; flows west of south into Mill Creek (tributary to Santa Ana River, which discharges to the Pacific); length, about 2 miles; fall, 3,400 feet. San Gorgonio sheet.

Hill Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends eastward from Suisun Creek. Napa sheet.

Hilton Creek; Inyo and Mono counties; rises in the extreme northwestern part of Inyo County half a mile southeast of Mount Huntington; flows northward through several small lakes. The area to the north of the Mount Goddard quadrangle, on which the head of this creek is shown, has not yet been mapped by the United States Geological Survey and the creek is not shown on the Land Office map of California; it is therefore not known to the compiler whether it is tributary to Owens River through Rock Creek or whether it enters the river direct.

Hobson Creek; Sonoma County; rises in the central part of T. 8 N., R. 10 W., Mount Diablo base and meridian; flows southeastward 2 miles into Russian River (tributary to the Pacific). Punnett's map of Sonoma County.

Hogback Creek; Owens River basin; Inyo County; rises on the east slope of the Sierra 2 miles southeast of Round Mountain, at altitude 8,200 feet above sea level; flows northeastward 2 miles, then north of east 2 miles to the edge of Owens Valley, where its waters sink; fall, 4,200 feet. Olancha sheet.

Hogback Creek; Owens River basin; Inyo County; rises on the east slope of the Sierra half a mile east of Tunnabora Peak, at altitude 12,000 feet above sea level; flows northeastward about 9 miles to the edge of Owens Valley in the southern part of T. 14 S., R. 35 E., Mount Diablo base and meridian,

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where its waters sink; fall, 7,700 feet of which 5,500 is made in the first 3 miles. Mount Whitney sheet.

Hog Lake; Riverside County; southwestern part of T. 6 S., R. 3 E., San Bernardino base and meridian; outlet, Bautiste Creek to San Jacinto Valley; altitude, about 4,700 feet. San Jacinto sheet.

Hog Valley Creek; Monterey and San Luis Obispo counties; rises in the northwestern part of T. 24 S., R. 14 E., Mount Diablo base and meridian; flows southwestward to Estrella, where it joins Estrella Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 14 miles. Land Office map of California, 1907.

Holcomb Creek; Mohave River basin; San Bernardino County; rises in the southeastern part of T. 3 N., R. 1 W., San Bernardino base and meridian, in Holcomb Valley, at altitude 7,200 feet above sea level; flows westerly 12 miles to its junction with Deep Creek (tributary to Mohave River); fall, 2,700 feet; tributaries short and unimportant. San Gorgonio and Deep Creek sheets.

Holcomb Creek; Santa Ana River basin; San Bernardino County; rises in the northern part of T. 1 N., R. 2 E., San Bernardino base and meridian, 3 miles east of Sugarloaf Mountain, at altitude 8,750 feet above sea level; flows southwestward 4 miles to its junction with Santa Ana River, which discharges to the Pacific; fall, 2, 250 feet. San Gorgonio sheet.

Hollenbeck Canyon Creek; San Diego County; rises in the north-central part of T. 17 S., R. 2 E., San Bernardino base and meridian, at altitude 2,000 feet above sea level; flows southwestward into Dulzura Creek (tributary to Jamul Creek, which discharges to lower Otay reservoir); length, about 4 miles; fall, about 1,300 feet; intermittent. Cuyamaca sheet.

Hollis Creek; Alameda County; rises on the western slope of Divide Ridge, at altitude 1,000 feet above sea level; flows southwestward and westward about 3 miles to its junction with Eden Creek (tributary through Palo Creek to San Lorenzo Creek, which discharges to San Francisco Bay); fall, 500 feet. Pleasanton and Haywards sheets.

Hollow Tree Creek; Mendocino County; rises in the southeastern part of T. 22 N., R. 17 W., Mount Diablo base and meridian; flows very irregularly northwestward 8 miles, then northeastward to its junction with South Fork of Eel River (tributary to Eel River, which discharges to the Pacific); length, including major windings, 14 miles. Punnett's map of Mendocino County.

Holser Canyon Creek; Los Angeles and Ventura counties; an intermittent stream, about 3 miles long, flowing westward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) in Temescal Rancho, 2 miles north of Camulos. Camulos sheet.

Honeydew Creek; Humboldt County; rises in the southern part of T. 3 S., R. 1 E., Humboldt base and meridian; flows northwestward 3 miles, then east of north 3 miles into Mattole River (tributary to the Pacific). Punnett's map of Humboldt County.

Honey Lake; Lassen County, Cal., east of the Sierra and just west of the California-Nevada State line. The lake occupies a shallow depression and may be classed as a playa lake as it is completely desiccated during seasons of unusual aridity; it is supplied principally by Susan River, which enters from the northwest, but it receives also some tribute during the rainy season from Long Valley. The hot springs along its northern border also furnish considerable quantities of water. The area of the lake varies with the seasons as well as from year to year. It was surveyed in 1864 prior to any irrigation development and was found, according to Land Office records, to cover 64,000 acres. The outline of the lake is indefinite, as its shores are usually low and marshy and in places form broad tule swamps. Its waters are strongly alkaline, are unfit

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for human use, and always of a greenish-yellow color caused by impalpable mud held in suspension.

As mapped by the Survey in charge of Captain Wheeler, in 1867, the lake covered an area of approximately 90 square miles. In the summers of 1859 and 1863 it completely dried up, leaving a broad, smooth plain of cream-colored mud. Its average depth in the summer of 1877 is reported by Lieut. Symonds[1] to have been about 18 inches. In 1882 its greatest depth was 4 feet but the average, as nearly as could be judged, did not differ greatly from the depth given for 1877.

In 1882, when the lake was surveyed by the topographers of the United States Geological Survey, the altitude of the water surface was 3,949 feet above sea level; the maximum length east-west was about 14 miles and the width in the narrowest, central portion, about 4 miles.

In 1902–3 the Reclamation Service reported the lake bed dry "for the third time within the memory of white settlers. Evaporation as measured at Lake Tahoe, is approximately 30 inches. At Pyramid Lake to the east of Honey Lake it is believed to be 50 inches. Honey Lake, lying somewhat intermediate between these two is believed to have an annual evaporation from its surface of 42 inches. From this it is fair to assume that when the lake covers its normal area fully 200,000 acre-feet of water passes from its surface by evaporation. All the streams of the Honey Lake basin drain into the lake as a sink, and this evaporation of 200,000 acre-feet represents the mean annual discharge of the basin."

Authorities: Lassen Peak and Honey Lake sheets; Mon. U. S. Geol. Survey, vol. 11, 1885, pp. 55–56; Second Ann. Rept. U. S. Reclamation Service, 1902–3, pp. 114–115.

Hooker Creek; Sonoma County; rises in the western part of T. 6 N., R. 5 W., Mount Diablo base and meridian, at altitude 2,000 feet above sea level; flows southward and southwestward; connected with Sonoma Creek (tributary to San Pablo Bay) only in times of flood. Napa sheet.

Hooks Creek; San Bernardino County; rises in the southeastern part of T. 2 N., R. 3 W., San Bernardino base and meridian, at altitude 5,700 feet above sea level; flows northeastward 3 miles to its junction with Little Bear Creek (tributary to Deep Creek, which discharges to Mohave River); fall, 900 feet. Redlands and Deep Creek sheets.

Hoover Lake; Mono County; northeastern part of T. 2 N., R. 24 E., Mount Diablo base and meridian; inlet, East Fork of Green Creek; outlet, East Fork of Green Creek to Green Creek (tributary through Virginia Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); altitude, 9,850 feet; above Gilman Lake, 400 feet. Bridgeport sheet.

Hopkins Ravine Creek; Solano County; an intermittent stream, 3 miles long, rising in the Montezuma Hills and flowing southwestward into the tidal marsh on the north side of Suisun Bay. Antioch sheet.

Hopper Canyon Creek; Ventura County; rises in the northeastern part of T. 5 N., R. 19 W., San Bernardino base and meridian, at altitude 4,300 feet above sea level; flows southward to Santa Clara River (tributary to the Pacific Ocean) just west of Buckhorn; length, about 10 miles; fall, 3,700 feet. Tejon and Camulos sheets.

Hoppow Creek; Del Norte County; rises in the northeastern part of T. 13 N., R. 1 E., Humboldt base and meridian; flows southwestward 3 miles, then northwestward three-fourths mile into Klamath River (tributary to the Pacific). Punnett's map of Del Norte County.

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[1] Ann. Rept. U. S. Geol. Surveys W. 100th Mer. for 1878, p. 115.

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Horn Canyon Creek; Ventura County; an intermittent stream, 2 miles long, rising in the southern part of T. 5 N., R. 22 W., San Bernardino base and meridian, and flowing southwestward to east end of Ojai Valley; the drainage of this part of the valley passes eastward to San Antonio Creek, which discharges to Ventura River (tributary to the Pacific). Santa Paula sheet.

Horno Canyon Creek; San Diego County; rises 2 miles east of San Onofre Mountain, at altitude 850 feet above sea level; flows southwestward about 4 miles to the Pacific. San Luis Rey sheet.

Horns Creek; Siskiyou County; rises in the west-central part of T. 10 N., R. 7 E., Humboldt base and meridian; flows in general northeastward to its junction with Salmon River (tributary through Klamath River to the Pacific) 1 mile below Forks of Salmon; length, about 3½ miles. Punnett's map of Siskiyou County.

Horse Canyon Creek; Riverside County; rises about 2 miles southwest of Santa Rosa Mountain, at altitude 5,200 feet above sea level; flows northwestward 2 miles, westward 2 miles, then somewhat east of south 5 miles into Coyote Creek, which discharges into Borego Valley; intermittent in part of course; fall, 2,500 feet. San Jacinto and Ramona sheets.

Horse Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the southern part of T. 2 N., R. 9 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows northeastward into San Gabriel River (tributary to the Pacific); length, 2 miles; fall, 1,300 feet; tributary, East Fork; intermittent. Pomona sheet.

Horse Canyon Creek; Santa Maria River basin; Santa Barbara county; an intermittent stream, 8 miles long, rising in the western part of T. 10 N., R. 29 W., and flowing southwestward into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Santa Ynez and Lompoc sheets.

Horse Canyon Creek, East Fork; Los Angeles County; rises in the southeastern part of T. 2 N., R. 9 W., San Bernardino base and meridian, at altitude 2,600 feet above seal level; flows northward into Horse Canyon Creek (tributary to San Gabriel River, which discharges to the Pacific); length, 1 mile; fall, 750 feet; intermittent. Pomona sheet.

Horse Creek; Humboldt County; rises in the south-central part of T. 4 S., R. 1 E., Humboldt base and meridian, on the east slope of Horse Mountain; flows southwestward into the Pacific; length, 2 miles. Punnett's map of Humboldt County.

Horse Creek; Klamath River basin; Siskiyou County; rises in the northern part of T. 47 N., R. 11 W., Mount Diablo base and meridian; flows in general southeastward to its junction with Klamath River (tributary to the Pacific) in the central part of T. 46 N., R. 10 W.; length, about 10 miles; principal tributaries, Middle and Buckhorn creeks; drains eastern slope of Horse Creek Mountains. Punnett's map of Siskiyou County.

Horse Creek; San Jacinto River basin; Riverside County; rises in the eastern part of T. 6 S., R. 2 E., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows westward 4 miles to Bautiste Creek (tributary to San Jacinto River); fall, about 1,600 feet; intermittent. San Jacinto sheet.

Horse Creek; Walker River basin; Mono County; rises in the central part of T. 3 N., R. 24 E., Mount Diablo base and meridian, on the north slope of Twin Peaks, at altitude 11,000 feet above sea level; flows west of north 3½ miles into Robinson Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); fall, about 3,900 feet. Bridgeport sheet.

Horse Lake; Lassen County; a small playa lake between Honey Lake Valley and the Madeline Plains. "Its ancient channel of overflow is carved

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through a volcanic mesa and joins Snowstorm Canyon [not named on the map]. In 1868 the lake rose sufficiently to overflow and send some tribute to Honey Lake through its long-abandoned channel. The bottom of the outlet is about 10 feet above the usual level of the lake, showing that the high water of 1868 was considerably more than the ordinary winter's rise. The lake became dry in the summer of 1878 and 79, its bottom forming a hard, smooth, mud plain".[1]

On the Honey Lake sheet (surveyed in 1882) the lake is shown as a permanent water body, about 3 miles in maximum length and 2 miles wide, lying at altitude about 5,000 feet above sea level.

Horse Minto Creek; Humboldt County; rises in the southwestern part of T. 8 N., R. 7 E., Humboldt base and meridian, on the west slope of Trinity Mountains; flows southward 3 miles, then in general north of west 10 miles to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Horseshoe Lake; Riverside County; an intermittent water body lying half a mile north of Santa Ana River (tributary to the Pacific) 5 miles west of Riverside. Riverside sheet.

Horsethief Canyon Creek; Mohave River basin; San Bernardino County; rises near Cajon Pass, at altitude 3,950 feet above sea level; flows south of east toward the West Fork of Mohave River to which it delivers its flood waters. An intermittent stream is indicated in the upper 2 miles of the canyon; the lower part is shown as a sandy wash. Hesperia sheet.

Horsethief Canyon Creek; Santa Ana River basin; Riverside County; an intermittent stream, about 3 miles long, flowing into the valley of Temescal Creek (tributary to Santa Ana River, which discharges to the Pacific). Elsinore sheet.

Horsethief Canyon Creek; Tia Juana River basin; San Diego County; rises in the northeastern part of T. 16 S., R. 3 E., San Bernardino base and meridian, at altitude 3,500 feet above sea level; flows southwestward 5 miles, then south of east 1 mile into Pine Valley Creek (tributary through Cottonwood Creek to Tia Juana River, which discharges to the Pacific); fall, 1,500 feet; intermittent. Cuyamaca sheet.

Horsethief Creek; Riverside County; an intermittent stream rising on the north slope of Santa Rosa Mountains and flowing northwestward to Deep Canyon Creek, which discharges northward to the Colorado Desert; about 5 miles long. Indio special sheet.

Horton Creek; Inyo County; Inyo National Forest; rises on the east slope of the Sierra, 1½ miles northwest of Mount Humphreys, at altitude 12,350 feet above sea level; flows northeastward into Round Valley, then southeastward to its junction with Owens River, which discharges to Owens Lake; length, about 18 miles; fall, about 8,000 feet of which 2,600 feet is made in about 2 miles at the head, above Horton Lake. Mount Goddard sheet.

Horton Lake; Inyo County; Inyo National Forest; inlet and outlet, Horton Creek, which flows through the lake to its junction with Owens River (tributary to Owens Lake); altitude, 9,750 feet. Mount Goddard sheet.

Hot Spring Canyon Creek; Cold Spring Canyon drainage basin; Santa Barbara County; an intermittent stream, 2 miles long, rising on the south slope of Montecito Peak and flowing southwestward into Cold Spring Canyon (which discharges to the Pacific) 1 mile northwest of Montecito. Santa Barbara sheet.

Hot Spring Canyon Creek; Santa Ynez River basin; Santa Barbara County; an intermittent stream, 2 miles long, rising on the north slope of Santa Ynez

[1] Russell, I. C., A geological reconnaissance in southern Oregon: Fourth Ann. Rept. U. S. Geol. Survey, 1884, p. 457.

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Mountains, in T. 5 N., R. 29 W., San Bernardino base and meridian, and flowing east of north to Santa Ynez River, which discharges to the Pacific. Santa Ynez sheet.

Hot Springs Creek; Ventura County; rises in the western part of T. 6 N., R. 20 W., San Bernardino base and meridian, west of San Rafael Peak; flows southeastward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 5 miles; fall, 2,200 feet; principal tributary, Coldwater Fork. Mount Pinos and Tejon sheets.

Hot Springs Canyon Creek; Orange County; an intermittent stream rising on the east slope of Los Pinos Peak, at altitude 4,000 feet above sea level, and flowing southwesterly about 8 miles into San Juan Canyon Creek at San Juan Hot Springs; fall, 3,300 feet. Elsinore and Corona sheets.

Hot Springs Creek; Alpine County. *See* Markleeville Creek.

Howard Canyon; Santa Barbara County; eastern part of Los Alamos Rancho; opens southwestward to Los Alamos Valley (drained by San Antonio Creek, which discharges to the Pacific). Lompoc sheet.

Howard Creek; Mendocino County; rises in the northern part of T. 21 N., R. 17 W., Mount Diablo base and meridian; flows southwestward and enters the Pacific 1 mile north of De Haven; length, 3½ miles. Punnett's map of Mendocino County.

Howard Creek; Santa Clara River basin; Ventura County; rises in the western part of T. 5 N., R. 22 W., San Bernardino base and meridian; flows northward to its junction with Rose Valley Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific); length, 2½ miles; intermittent. Mount Pinos sheet.

How Creek; Humboldt County; rises in the western part of T. 1 N., R. 1 W., Humboldt base and meridian; flows northeastward 5 miles into Eel River (tributary to the Pacific). Punnett's map of Humboldt County.

Huckleberry Canyon Creek; Inyo County; Inyo National Forest; rises 1 mile northeast of Mount Tom, at altitude 11,100 feet above sea level; flows northeastward; sinks before reaching Pine Creek (tributary through Rock Creek to Owens River, which discharges to Owens Lake); length, about 3 miles. Mount Goddard sheet.

Hudeman Slough; Sonoma and Napa counties; extends southeastward from the junction of Third and Second Napa sloughs to Napa Slough. Napa sheet.

Hudson Creek; Siskiyou County; rises in the western part of T. 48 N., R. 6 W., Mount Diablo base and meridian, at altitude 3,300 feet above sea level; flows in general southward 3 miles into Cottonwood Creek (tributary to Klamath River, which flows into the Pacific); fall, 800 feet. Shasta sheet.

Huer Huerco Creek; San Luis Obispo County; rises in the northeastern part of T. 29 S., R. 14 E., Mount Diablo base and meridian; flows northwestward into Salinas River (tributary to the Pacific) north of Paso Robles; length, about 25 miles. Land Office map of California, 1907.

Hughes Lake; Los Angeles County; southeastern part of T. 7 N., R. 15 W., San Bernardino base and meridian; occupies a depression in an alluvial trough coinciding with the San Andreas fault zone; receives the drainage of a small area in the surrounding hills and occasionally waters overflowing from Elizabeth Lake; outlet, a southward-flowing stream tributary to Santa Clara River. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 14 and Pl. VI.

Huichica Creek; Napa County; rises about 5 miles west of Napa, at altitude 300 feet above sea level; flows southward into Hudeman Slough, one of the many sloughs in the tidal marsh between Sonoma Creek and Napa River; length above the slough, about 5 miles; intermittent. Napa sheet.

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Hull Creek; Mendocino County; rises in the eastern part of T. 24 N., R. 12 W., Mount Diablo base and meridian; flows southwestward 6 miles, then somewhat west of north 8 miles to its junction with North Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Hunter Creek; Del Norte County; rises in the southeastern part of T. 15 N., R. 1 E., Humboldt base and meridian; flows southwestward 8 miles to its junction with Klamath River (tributary to the Pacific) near Requa. Punnett's map of Del Norte County.

Humbug Creek; Siskiyou County; rises in the northwestern part of T. 45 N. R. 8 W., Mount Diablo base and meridian, at altitude 4,000 feet above sea level; flows eastward 4 miles, then northeastward 4 miles into Klamath River (tributary to the Pacific); fall, 2,000 feet. Shasta sheet.

Humbug Creek, Little; Siskiyou County; rises in the southwestern part of T. 46 N., R. 8 W., Mount Diablo base and meridian; flows northwestward 4 miles into Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

Hungry Creek; Siskiyou County; rises in the southwestern part of T. 48 N. R. 7 W., Mount Diablo base and meridian; flows westward 4 miles into Beaver Creek. Punnett's map of Siskiyou County.

Hurdy Gurdy Creek; Del Norte County; rises in the southern part of T. 17 N., R. 3 E., Humboldt base and meridian; flows southwestward to its junction with South Fork of Smith River (tributary to Smith River, which flows to the Pacific); length, 13 miles. Punnett's map of Del Norte County.

Icehouse Canyon Creek; San Bernardino County; rises in central part of T. 2 N., R. 7 W., San Bernardino base and meridian, on the north slope of the San Antonio Mountains, at altitude 7,750 feet above sea level: flows north of west about 3 miles into San Antonio Canyon Creek, through which it is tributary to Santa Ana River, which discharges to the Pacific; fall, 2,900 feet. Cucamonga sheet.

Illinois River; Siskiyou County, Cal., Josephine and Curry counties, Oreg.; formed in the southern part of T. 19 N., R. 5 E., Humboldt base and meridian, by the union of its East and West branches. The East Branch, which drains the larger area and is therefore considered the continuation of the main stream, rises in the western part of T. 18 N., R. 6 E., Humboldt base and meridian, and flows northwestward to the point at which it receives the West Branch; from this junction the general course of the Illinois is northwestward to Agness in Curry County, Oreg., where it turns abruptly and flows westward and southwestward to Gold Beach, where it enters the Pacific. Only a very small portion of the drainage basin of the Illinois lies in California, the named streams which thus find outlet to the Pacific comprising Applegate and Elliott creeks, which discharge to the Illinois through Rogue River, and the East and West branches of the Illinois itself. Punnett's map of Siskiyou County.

Illinois River, East Branch. *See* Illinois River.

Illinois River, West Branch; Siskiyou County; rises in the southern part of T. 18 N., R. 5 E., Humboldt base and meridian, on the east slope of the Siskiyou Mountains; flows in general northward to the southern part of T. 19 N., R. 5 E., where it unites with the East Branch to form Illinois River (tributary to the Pacific); length, about 7 miles. Punnett's map of Siskiyou County.

Independence Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 14 N., R. 8 E., Humboldt base and meridian, on the west slope of Marble Mountain; flows northward and northwestward 9 miles, then southwestward and westward 4 miles to its junction with Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

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Independence Creek; Truckee River basin; Sierra County; rises in Independence Lake in the southern part of T. 19 N., R. 15 E., Mount Diablo base and meridian, at altitude 6,950 feet above sea level; flows east of north 3½ miles, then eastward half a mile into Little Truckee River (tributary to Truckee River, which discharges to Pyramid and Winnemucca lakes); fall, about 600 feet. Gaging station below Independence (1902–1907). Truckee sheet.

Independence Lake; Nevada and Sierra counties; northern part of T. 18 N., R. 15 E., and southern part of T. 19 N., R. 15 E., Mount Diablo base and meridian; three inflowing streams mapped; outlet, Independence Creek to Little Truckee River (tributary through Truckee River to Pyramid and Winnemucca lakes); altitude, 6,950 feet. Nearly all of the lake is in Nevada County but the outlet is in Sierra County. Truckee sheet.

Indian Creek; Alameda Creek basin; Alameda County; rises in the northeastern part of T. 5 S., R. 2 E., Mount Diablo base and meridian, on the northern slope of Valpe Ridge and the southwestern slope of Wauhab Ridge, at altitude 3,150 feet above sea level; flows northwestward between the Wauhab and Valpe ridges to La Costa Valley, where it joins San Antonio Creek (tributary through Alameda Creek to San Francisco Bay); length, 8½ miles; fall, 2,650 feet. Tesla and Pleasanton sheets.

Indian Creek; Eel River basin; Mendocino County; rises in the northeastern part of T. 20 N., R. 13 W., Mount Diablo base and meridian; flows westward into Eel River (tributary to the Pacific); length, 3½ miles. Punnett's map of Mendocino County.

Indian Creek; Eel River basin; Mendocino County; rises in the eastern part of T. 24 N., R. 19 W., Mount Diablo base and meridian; flows northeastward to the southern part of T. 5 S., R. 3 E., Humboldt base and meridian, then southeastward 2 miles to its junction with South Fork of Eel River (tributary to the Pacific); length, about 10 miles. Punnett's map of Mendocino County.

Indian Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 19 N., R. 6 E., Humboldt base and meridian; flows southeastward to its junction with Klamath River (tributary to the Pacific) at Happy Camp; length, about 18 miles; principal tributaries, Mill Creek, South and East forks of Indian, and Doolittle Creek. Gaging station near Happy Camp (1911–12.) Punnett's map of Siskiyou County.

Indian Creek; Klamath River basin; Siskiyou County; rises in the northeastern part of T. 45 N., R. 9 W., Mount Diablo base and meridian; flows west of south about 12 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific); tributary, French Creek; other tributaries unnamed. Punnett's map of Siskiyou County.

Indian Creek; Klamath River basin; Trinity County; rises in the northwestern part of T. 5 N., R. 7 E., Mount Diablo base and meridian; flows southeast and south 3 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Indian Creek; Klamath River basin; Trinity County; rises in the west-central part of T. 31 N., R. 8 W., Mount Diablo base and meridian; flows northwestward to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, about 11 miles. Punnett's map of Trinity County.

Indian Creek; Navarro River basin; Mendocino County; rises in the south-central part of T. 14 N., R. 13 W., Mount Diablo base and meridian; flows northwestward to the northern part of T. 14 N., R. 14 W., then in general southwestward to its junction with Anderson and Rancheria creeks, with which it forms Navarro River (tributary to the Pacific); length, about 11 miles; a north fork

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of this stream, unnamed on the map, drains small areas in the southern part of T. 15 N., Rs. 13 and 14 W., and the northeastern corner of T. 14 N., R 14 W. Punnett's map of Mendocino County.

Indian Creek; Salinas River basin; San Luis Obispo County; rises in the San Luis Obispo National Forest, in the southwestern part of T. 28 S., R. 15 E., Mount Diablo base and meridian; flows west of north about 14 miles to its junction with Estrella Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

Indian Creek; San Bernardino County; T. 13 N., R. 11 E., San Bernardino base and meridian; a desert drainage way. Ivanpah sheet.

Indian Creek; San Jacinto River basin; Riverside County; rises in the southeastern part of T. 4 S., R. 1 E., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows southwestward 4 miles, north of west 2 miles to its junction with San Jacinto River; fall, 1,200 feet. San Jacinto sheet.

Indian Creek; Santa Ynez River basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the southeast slope of Big Pine Mountain, at altitude 6,000 feet above sea level; flows irregularly southward to its junction with Mono Creek, through which it is tributary to Santa Ynez River (tributary to the Pacific); length, about 15 miles; fall, 3,500 feet; principal tributary, Buckhorn Creek. Santa Ynez sheet.

Indian Creek, East Fork; Klamath River basin; Siskiyou County; rises in the southwestern part of T. 19 N., R. 7 E., Humboldt base and meridian; flows southeastward 5 miles, then southward and southwestward 4 miles to its junction with Indian Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Indian Creek, South Fork; Klamath River basin; Siskiyou County; rises in the northern part of T. 17 N., R. 5 E., Humboldt base and meridian, on the east slope of Siskiyou Mountains; flows in general eastward to its junction with Indian Creek (tributary to Klamath River, which flows to the Pacific); length, 12 miles. Punnett's map of Siskiyou County.

Indian Gulch Creek; Alameda County; an intermittent stream flowing into Lake Merritt just north of East Oakland. Concord sheet.

Indian Gulch Creek; Trinity County; rises in the east-central part of T. 35 N., R. 11 W., Mount Diablo base and meridian; flows south of west 3 miles into East Fork of North Fork Trinity River (tributary through North Fork Trinity to Trinity and thus to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Indian Valley Creek; Klamath River basin; Trinity County; rises in the southern part of T. 2 N., R. 8 E., Humboldt base and meridian; flows northwestward to its junction with South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 10 miles; principal tributary, Bitter Creek. Punnett's map of Trinity County.

Indian Valley Creek; Salinas River basin; Monterey County; rises in the southern part of T. 21 S., R. 12 E., Mount Diablo base and meridian; flows southwestward into Salinas River, which discharges to the Pacific in Monterey Bay; length, about 18 miles; tributary, Nelson Creek. Land Office map of California, 1907.

Irish Creek; Mendocino County; rises in the northern part of T. 13 N., R. 16 W., Mount Diablo base and meridian; flows westward 3 miles, and enters the Pacific 1 mile south of the mouth of Mallo Pass Creek. Punnett's map of Mendocino County.

Iron Canyon Creek; Los Angeles County; rises in the southern part of T. 4 N., R. 14 W., San Bernardino base and meridian, 1½ miles west of Iron Mountain, at altitude 3,250 feet above sea level; flows southwestward 1 mile, north

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of west 2 miles toward Sand Canyon (tributary to Santa Clara River, which discharges to the Pacific); delivers water below mouth of canyon only in times of flood; fall above mouth of canyon, 1,250 feet. Fernando sheet.

Iron Fork. *See* San Gabriel River, Iron Fork.

Iron Point Creek; Mendocino County; rises in the southwestern part of T. 23 N., R. 14 W., Mount Diablo base and meridian, on the east slope of Iron Peak; flows eastward into Eel River (tributary to the Pacific); length, 2 miles. Punnett's map of Mendocino County.

Irving Creek; Siskiyou County; rises in the western part of T. 13 N., R. 7 E. Humboldt base and meridian; flows southwestward 5 miles and north of west 2 miles to its junction with Klamath River (tributary to the Pacific) near Halverson. Punnett's map of Siskiyou County.

Isabel Creek; Santa Clara County; rises in Isabel Valley, in Los Huecos Rancho, at altitude about 2,500 feet above sea level; takes a very irregular but in general northwesterly course to the southwestern part of T. 6 S., R. 3 W., Mount Diablo base and meridian, where it unites with Smith Creek to form Arroyo Hondo (tributary to Calaveras Creek, which discharges through Alameda Creek to San Francisco Bay); length, including major windings, about 15 miles: receives the drainage from the northern slope of Mount Hamilton; only two tributaries, Bonito and Long Branch creeks, named on the map. Mount Hamilton sheet.

Isham Creek; San Diego County; rises in southeastern part of T. 14 S., R. 2 E., San Bernardino base and meridian, at altitude 2,100 feet above sea level; flows north of west into San Diego River, which discharges to the Pacific through False Bay; intermittent; length, 2 miles; fall, 1,200 feet. Cuyamaca sheet.

Islais Creek; San Francisco County; rises near Ocean View, at altitude 225 feet; flows northeastward to San Francisco Bay; length, about 4 miles. San Mateo sheet.

Islay Creek; San Luis Obispo County; rises in T. 31 S., R. 11 E., Mount Diablo base and meridian, in the San Luis Range, at altitude 1,200 feet above sea level; flows in general north of west to the point at which it enters the Pacific; length, about 7 miles. Cayucos sheet.

Islip Canyon Creek; Los Angeles County; rises in northeastern part of T. 1 N., R. 10 W., San Bernardino base and meridian, at altitude 2,250 feet above sea level; flows southeastward 1½ miles into San Gabriel River (tributary to the Pacific); fall, 1,150 feet; intermittent. Pomona sheet.

Italian Creek; Trinity County; rises in the southern part of T. 6 N., R. 7 E., Humboldt base and meridian; flows east of south 4 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Ivanpah Dry Lake; San Bernardino County; in Ivanpah Valley, in Tps. 16 and 17 N., R. 15 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I; Ivanpah sheet, on which the lake is outlined.

Jackson Lake; Siskiyou County; northwestern part of T. 39 N., R. 9 W., Mount Diablo base and meridian; outlet, South Fork of Scott River (tributary through Scott River to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Jackass Creek; Mendocino County; rises in the western part of T. 24 N., R. 18 W., Mount Diablo base and meridian; flows southeast 1½ miles, south 1 mile, and southwestward 2 miles; enters the Pacific at Bear Harbor. Punnett's map of Mendocino County.

Jackass Creek; Siskiyou County; rises in the west-central part of T. 40 N., R. 11 W., Mount Diablo base and meridian; flows southwestward into North

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Fork of Salmon River (tributary through Salmon River to Klamath River, which discharges to the Pacific); length, 2 miles. Punnett's map of Siskiyou County.

Jacobi Creek; Humboldt County; rises in the northern part of T. 4 N., R. 2 E., Humboldt base and meridian; flows northwestward to the northern part of T. 5 N., R. 1 E., where it enters Humboldt Bay; length, about 8 miles. Punnett's map of Humboldt County.

Jagel Slough; Santa Clara County; in the tidal marsh in the southern part of San Francisco Bay. Palo Alto sheet.

Jalama Creek; Santa Barbara County; rises in the southern part of San Julian Rancho; flows westward to the Pacific near Jalama station; length, 8 miles; fall, 700 feet; principal tributaries, Escondido, Gasper, and Espada creeks. Lompoc sheet.

James Creek; San Benito County; rises in northwestern part of T. 17 S., R. 10 E., Mount Diablo base and meridian; flows west of south into San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, 5 miles. Land Office Map of California, 1907.

Jamul Creek; Otay River basin; San Diego County; rises in the northwestern part of T. 17 S., R. 2 E., San Bernardino base and meridian, at altitude about 1,700 feet above sea level; flows southwestward and discharges into lower Otay reservoir; length, 10 miles; fall, 1,200 feet; intermittent; principal tributary, Dulzura Creek. Cuyamaca sheet.

Javon Canyon Creek; Ventura County; an intermittent stream, about 2 miles long, flowing southwestward to the Pacific 1 mile southeast of Seacliff. Ventura sheet.

Jennie Creek; Jackson County, Oreg., and Siskiyou County, Cal.; rises in the northeastern part of T. 39 S., R. 5 E., Willamette meridian; takes a general southerly course to its junction with Klamath River in Siskiyou County, Cal., in the southern part of T. 48 N., R. 5 W., Mount Diablo base and meridian; length, 20 miles; fall, 1,300 feet; principal tributaries, Beaver and Kern creeks, both draining small areas in Jackson County, Oregon. Called Fall Creek on the Shasta sheet; Jenny Creek on Land Office maps of California and Oregon, and on the Ashland sheet; and Jennie Creek on Punnett's map of Siskiyou County.

Jewett Creek; Humboldt County; rises in the southwestern part of T. 4 S., R. 5 E., Humboldt base and meridian; flows northeastward 6 miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Humboldt County.

Johnson Canyon Creek; San Diego County; rises in the southwestern part of T. 18 S., R. 1 E., San Bernardino base and meridian, at the west end of San Ysidro Mountains, at altitude 700 feet above sea level; flows northwestward into Otay River (tributary to the Pacific); length, 3 miles; fall, 400 feet; intermittent. Cuyamaca sheet.

Johnson Creek; San Benito County; rises in the northern part of T. 16 S., R. 6 E., Mount Diablo base and meridian; flows northeastward into San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 8 miles; tributary, Willow Creek. Land Office Map of California, 1907.

Jones Creek; Del Norte County; rises in the southwestern part of T. 17 N., R. 4 E., Humboldt base and meridian; flows southwestward to its junction with South Fork of Smith River (tributary to Smith River, which flows to the Pacific); length, 13 miles. Punnett's map of Del Norte County.

Jones Gulch Creek; San Mateo County; a stream, about 1½ miles long, rising in the southeastern part of T. 7 S., R. 4 W., and flowing southward to Pescadero Creek, which discharges to the Pacific. Santa Cruz sheet.

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Jughandle Creek; Mendocino County; rises in the northern part of T. 17 N., R. 17 W., Mount Diablo base and meridian; flows northwestward; enters the Pacific 1 mile northwest of Caspar; length, 4 miles. Punnett's map of Mendocino County.

June Lake; Mono County, Mono National Forest; northeastern part of T. 2 S., R. 26 E., Mount Diablo base and meridian, 2 miles southeast of Reversed Peak; outlet, Reversed Creek to Rush Creek, which discharges to Mono Lake; altitude, 7,631 feet. Mount Lyell sheet.

Juniper Creek; Placer and Nevada counties; rises in Placer County in the southwestern part of T. 17 N., R. 18 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows northwestward 7 miles to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes) in the southern part of T. 18 N., R. 17 E.; fall, 2,800 feet. Truckee sheet.

Juniper Lake; Lassen County; central part of T. 30 N., R. 6 E., Mount Diablo base and meridian; neither inlet nor outlet shown on map; altitude, about 7,300 feet above sea level. Lassen Peak sheet.

Kagel Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream, 3 miles long, flowing southward and joining Little Tujunga Wash just west of the mouth of the canyon of the Little Tujunga. Fernando sheet.

Kaiser Creek; Contra Costa and Alameda counties; rises in the south-central part of T. 1 S., R. 2 W., Mount Diablo base and meridian, on the west slope of Rocky Ridge, at altitude about 1,100 feet above sea level; takes an irregular but in general southwesterly course to its junction with San Leandro Creek (tributary through San Leandro Bay to San Francisco Bay); fall, about 700 feet. Concord sheet.

Kalmer Gulch Creek; Sonoma County; rises in the northeastern part of T. 8 N., R. 13 W., Mount Diablo base and meridian; flows southwestward into the Pacific 2 miles northwest of Fort Ross; length, 2½ miles. Punnett's map of Sonoma County.

Kane Dry Lake; Kern County; T. 30 S., R. 38 E., Mount Diablo base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, Pl. I and p. 50.

Kekawaka Creek; Trinity County; rises in the northern part of T. 5 S., R. 7 E., Humboldt base and meridian; flows northwestward 6 miles, then southwestward 4 miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Trinity County.

Kellar Creek; San Bernardino County; rises in northeastern part of T. 1 N., R. 2 W., San Bernardino base and meridian, between Keller and Slide peaks, at altitude 7,500 feet above sea level; flows southwestward 4½ miles into Santa Ana River (tributary to the Pacific); fall, 4,900 feet; tributary, Monroe Canyon Creek. Redlands sheet.

Kelly Canyon Creek; Santa Barbara County; an intermittent stream rising in the southeastern part of T. 11 N., R. 30 W., San Bernardino base and meridian, and flowing northeastward into Cuyama River (Santa Maria River, which discharges to the Pacific); length, about 6 miles. Santa Ynez and McKittrick sheets.

Kelsey Canyon Creek. *See* Powell Canyon.

Kelsey Creek; Siskiyou County; rises in the central part of T. 44 N., R. 12 W., Mount Diablo base and meridian, in a small lake on the east slope of Marble Mountains; flows in general somewhat south of east to its junction with Scott River (tributary to Klamath River, which flows to the Pacific); length, 6 miles. Punnett's map of Siskiyou County.

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Kennedy Canyon Creek; Ventura County; an intermittent stream, about 3 miles long, rising near the east end of Santa Ynez Mountains, in T. 5 N., R. 23 W., San Bernardino base and meridian, and flowing southeastward and northeastward into Matilija Creek (tributary to Ventura River, which discharges to the Pacific) 1 mile southeast of Matilija. Ventura sheet.

Kentucky Creek; Santa Clara River basin; Los Angeles County; rises in the northwestern part of T. 4 N., R. 11 W., San Bernardino base and meridian; flows northwestward into Santa Clara River (tributary to the Pacific); length, about 6 miles. Land Office map of California, 1907.

Kewen Lake; Los Angeles County; south of Pasadena, in the northern part of T. 1 S., R. 12 W., overflow may pass southeastward to Rio Hondo (q. v.). Pasadena sheet.

Keyes Creek; Monterey and San Luis Obispo counties; rises in the northern part of T. 24 S., R. 14 E., Mount Diablo base and meridian; flows southwestward to Estrella Creek, through which it is tributary to Salinas River, which discharges to the Pacific through Monterey Bay; length, about 12 miles. Land Office map of California, 1907.

Keys Canyon Creek; San Diego County; rises in the southern part of T. 10 S., R. 1 W., San Bernardino base and meridian, at altitude 1,700 feet above sea level; flows northwestward to its junction with San Luis Rey River (tributary to the Pacific); length, about 11 miles; fall, about 1,500 feet; intermittent. San Luis Rey sheet.

Kidd Creek; Sonoma County; rises in the southwestern part of T. 8 N., R. 11 W., Mount Diablo base and meridian; flows southeastward 3 miles into Austin Creek (tributary to Russian River, which flows to the Pacific). Punnett's map of Sonoma County.

King Creek; San Diego County; rises in the western part of T. 14 S., R. 4 E., San Bernardino base and meridian, on the southern slope of Cuyamaca Peak, at altitude 5,500 feet above sea level; flows southwestward 6 miles, then westward and northwestward 4 miles to its junction with South Fork of San Diego River (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; fall, 4,000 feet; flows through Poverty Gulch. Cuyamaca sheet.

Kings Creek; Santa Cruz County; rises in the western part of T. 8 S., R. 2 W., Mount Diablo base and meridian, at altitude 2,500 feet above sea level; flows west of south 6 miles into San Lorenzo River, which discharges into the Pacific; fall, about 2,000 feet. Santa Cruz sheet.

Kirker Creek; Contra Costa County; rises in the northeastern part of T. 1 N., R. 1 W., Mount Diablo base and meridian, in Kirker Pass; flows northeastward through New York Slough to Suisun Bay; intermittent. Mount Diablo and Antioch sheets.

Klamath Lake, Lower; Klamath County, Oreg., and Siskiyou County, Cal., about two-thirds of the lake being in California. At high stages Lower Klamath Lake receives water from Klamath River; at low stages the direction of flow is reversed. The lower lake covers 29,400 acres with water; including water and marginal swamp the total area is 88,300 acres; altitude (Modoc Lava Bed sheet), 4,175 feet. Klamath and Modoc Lava Bed sheets; Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 178. See also Klamath project in annual reports of United States Reclamation Service.

Klamath Lake, Upper; Klamath County, Oreg.; principal inlets, Anna River, which rises in large springs supposed to be fed from Crater Lake; Williamson River, which drains the country to the northeast of Upper Klamath Lake, and the principal tributary of which is Sprague River; and small creeks draining the region to the northwest of the lake and discharging into Pelican Bay;

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outlet, Klamath River (called Link River in the stretch between Upper Klamath Lake and Lake Ewauna). The lake covers 67,220 acres and, including the marginal swamp lands, 94,000 acres; its altitude is about 4,141 feet. Ashland and Klamath sheets. See also reports on the Klamath project in the annual reports of the Reclamation Service.

Klamath River; Oregon-California; rises in Upper Klamath Lake, in Klamath County, Oreg.; takes a general southwesterly course to the northeastern part of Humboldt County, Cal., where it turns abruptly and flows northwestward to the point at which it enters the Pacific near Requa in Del Norte County, Cal.; length, including major windings, 180 miles.[1]

The drainage area lies east of the Cascade Range in south-central Oregon, and south of the Siskiyou Mountains, California. From Upper Klamath Lake, which stands 4,141 feet above sea level, flows Link River, a stream 1¼ miles long, discharging into Lake Ewauna at an elevation of 4,080 feet. Klamath Falls, the principal city of this part of Oregon, is on Link River. From Lake Ewauna to the town of Keno, a distance of 20 miles, Klamath River flows through a flat, marshy country. About 5 miles above Keno the river is connected with Lower Klamath Lake by a channel known as Klamath Straits. During high stages water flows from Klamath River to Lower Klamath Lake; during low stages the direction of flow is reversed. About half a mile below Keno the river breaks over a rocky ledge and here begins its precipitous fall of 100 to 200 feet per mile to its mouth. The drainage area above Keno, exclusive of Lower Klamath Lake, is 3,150 square miles; the total drainage area, measured at the mouth, is 11,850 square miles. The streams draining into Upper Klamath Lake head about 6,000 feet above sea level. Klamath Falls is 4,100 feet above sea level.

The drainage from the portion of the area lying in Oregon—the only portion that has been studied in detail—is collected in large lakes whose margins are wide, shallow, marsh lands. The principal stream flowing into upper Klamath Lake is Williamson River. The principal streams tributary to the Klamath below the lakes are Shasta, Scott, Salmon, and Trinity rivers. Lost River, Oreg., though not a tributary of the Klamath, is usually considered with it, as a slough connects the two. Water formerly flowed in either direction, depending on which stream was higher, but the flow is now stopped by an artificial dike.

Gaging stations near Happy Camp (1911–12) and Requa (1910–1912).

Authorities: Land Office map of California, 1907; Klamath, Ashland, Shasta, Modoc Lava Bed, and Red Bluff sheets, U. S. Geol. Survey; and Punnett's maps of Siskiyou, Trinity, Humboldt, and Del Norte counties; Water-Supply Paper U. S. Geol. Survey No. 291, p. 178.

Klondike Lake; Inyo County; southeastern part of T. 8 S., R. 33 E., Mount Diablo base and meridian, half a mile west of Owens River. Bishop sheet.

Knownothing Creek; Siskiyou County; rises in the central part of T. 9 N., R. 7 E., Humboldt base and meridian; flows northeastward into Salmon River (tributary to Klamath River, which flows to the Pacific); length, 7 miles. Punnett's map of Siskiyou County.

Kohler Creek; Alameda County; an intermittent stream, 1½ miles long, flowing southwestward into an unnamed stream which flows northwestward into Temescal Lake southeast of Berkeley. Concord sheet.

Laborda Canyon Creek; San Jacinto River basin; Riverside County; rises in the northwestern part of T. 3 S., R. 1 W., San Bernardino base and meridian, at altitude 2,200 feet above sea level; flows southward to the edge of San Jacinto Valley; fall, 700 feet. Elsinore sheet.

[1] Measured with wheel on post route map and Punnett's maps of Siskiyou, Humboldt, and Del Norte counties.

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Labrea Creek; Santa Barbara County; formed in the northern part of T. 9 N.. R. 31 W., San Bernardino base and meridian, by the junction of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the southern part of T. 11 N., R. 30 W., at altitude 3,500 feet above sea level, and flows southwestward 10 miles, then southeastward 2 miles to its junction with the South Fork; below the forks Labrea Creek flows southwesterly about 5 miles into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific); total fall to head of North Fork, 2,800 feet; as shown on map the creek is intermittent from source to mouth. Lompoc sheet.

Labrea Creek, North Fork. *See* Labrea Creek.

Labrea Creek, South Fork; Santa Barbara County; rises in the western part of T. 10 N., R. 29 W.. San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southwestward to its junction with the North Fork with which it forms Labrea Creek (tributary to Santa Maria River, which discharges to the Pacific); length, about 12 miles; fall, 3,500 feet; intermittent. Santa Ynez and Lompoc sheets.

La Broche Creek; Santa Clara River basin; Ventura County; an intermittent stream, 1½ miles long, rising in the northwestern part of T. 4 N., R. 21 W., San Bernardino base and meridian, and flowing southeastward into Santa Paula Creek (tributary to Santa Clara River, which discharges to the Pacific). Santa Paula sheet.

La Costa Creek; Alameda County; rises in the northeastern part of T. 5 S.. R. 2 E., Mount Diablo base and meridian. on the eastern slope of Wauhab Ridge, at altitude 3,400 feet above sea level; flows northwestward 5½ miles, then northeastward 1½ miles into San Antonio Creek (tributary through Alameda Creek to San Francisco Bay) at the eastern end of La Costa Valley; fall, 2,850 feet. Tesla and Pleasanton sheets.

Ladd Canyon Creek; Orange County; rises 1 mile southeast of Sugarloaf Peak, at altitude 2,400 feet; flows southwestward 4 miles into Silverado Canyon Creek (tributary through Santiago Creek to Santa Ana River, which discharges to the Pacific); the canyon forks twice, the East and West forks carrying short, intermittent streams; fall in the main canyon, 1,300 feet. Corona sheet.

Lafayette Branch; Contra Costa County; rises in the southeastern part of Sobrante Rancho, at altitude 700 feet above sea level; flows easterly about 7 miles to the town of Walnut Creek, where it unites with San Ramon Creek to form Walnut Creek; fall, 550 feet; principal tributaries, Pleasant Valley, Las Trampas, Reesley Valley, and Tlee Valley creeks. Concord sheet.

Lagoon, The; Alameda County; a pond lying in a depression in Ex Mission San Jose Rancho, 1 mile north of Irvington; a marsh surrounding it is fed by Mission Creek, an intermittent stream, draining a small area to the east; overflow from The Lagoon passes southward through Arroyo de la Laguna toward the tidal marsh north of Coyote River (tributary to San Francisco Bay). Pleasanton sheet.

Laguna Creek; Humboldt County; rises in the northern part of T. 9 N., R. 1 E., Humboldt base and meridian; flows west of north into Stone Lagoon; length, 4 miles. Punnett's map of Humboldt County.

Laguna Creek; Rincon Creek basin; Ventura County; an intermittent stream, 1¼ miles long, rising in the western part of T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing westward into Rincon Creek, which discharges to the Pacific. Ventura sheet.

Laguna Creek; Santa Cruz County; an intermittent stream, 3 miles long, rising in the northwestern part of Arroyo de la Laguna Rancho and flowing southwestward into the Pacific near Sand Hill Bluff. Santa Cruz sheet.

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Laguna de Santa Rosa; Sonoma County; heads in T. 6 N., R. 8 W., Mount Diablo base and meridian, where it receives Robert Crane and Copeland creeks and several unnamed streams; winds northwestward to the point at which it joins Santa Rosa Creek (tributary to Russian River, which flows to the Pacific) in T. 7 N., R. 9 W. Punnett's map of Sonoma County.

Laguna Puerco; San Francisco County; half a mile north of Merced Lake, in the Pueblo Lands of San Francisco; inlet, an intermittent stream entering the eastern end; no outlet shown on the map. San Mateo sheet.

Laguna Salada; San Mateo County; a brackish-water lagoon about half a mile long, separated from the Pacific by a narrow sand bar. San Mateo sheet.

Lagunitas Creek; Marin County; rises on the north slope of Mount Tamalpais (altitude, East Peak, 2,586 feet; West Peak, 2,604 feet), at altitude about 2,300 feet above sea level; flows northwestward to a point about a mile northwest of Lake Lagunitas where it bends to the west and southwest and again to the northwest, in which direction it continues to its junction with Paper Mill Creek in the northern part of Tomales y Bolinas Rancho; length, 10 miles; total fall, about 2,075 feet, of which 1,480 feet is made in the mile and a half above Lake Lagunitas, and 595 feet in the 8½ miles below. This creek flows along the base of Bolinas Ridge. Tamalpais sheet.

Lagunitas Lake; Marin County; southwestern part of Punta de Quentin Rancho; inlet, Lagunitas Creek; outlet, Lagunitas Creek to Paper Mill Creek (tributary to the Pacific through Tomales Bay); altitude, 820 feet; fall of outlet, about 595 feet. Tamalpais sheet.

La Honda Creek; San Gregorio Creek basin; San Mateo County; rises in the central part of T. 6 S., R. 4 W., Mount Diablo base and meridian, at altitude 2,000 feet above sea level; flows southeastward 2 miles, then somewhat west of south 5 miles to its junction with San Gregorio Creek (which discharges to the Pacific) near La Honda; fall, 1,600 feet. Santa Cruz sheet.

La Hoya Creek; Santa Barbara County; an intermittent stream, 3 miles long, rising in the Lompoc Hills, in San Julian Rancho and flowing eastward toward Salsipuedes Creek (tributary to Santa Ynez River, which discharges to the Pacific). Lompoc sheet.

Lake Canyon Creek; Mono Lake basin; Mono County; rises in the southwestern part of T. 2 N., R. 25 E., Mount Diablo base and meridian, at altitude 10,000 feet above sea level; flows east of north into Mill Creek (tributary to Mono Lake) near Lundy; length, about 3 miles; fall, about 2,200 feet; passes through Oneida, Crystal, and Blue lakes. The canyon is about 3 miles long and has a low grade except near its point of junction with Lundy Canyon, but the bottom of the main gorge is 1,000 feet lower than the bottom of its tributary and the waters of Lake Canyon flow in cascades over solid rock to join the stream below.[1] Mount Lyell and Bridgeport sheets.

Lake Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2 miles long, flowing southwestward into Sexton Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific) in the southwestern part of Ex Mission San Buenaventura Rancho. Santa Paula sheet.

Lake Creek; San Bernardino County; rises in southeastern part of T. 2 N., R. 1 W., San Bernardino base and meridian, in Bluff Lake, at altitude 7,450 feet above sea level; flows southwestward about 3 miles into Bear Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 2,700 feet. San Gorgonio and Redlands sheets.

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[1] Russell, I. C., Quaternary history of Mono Valley, Cal.: Eighth Ann. Rept. U. S. Geol. Survey, 1889, p. 332.

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Lake of the Woods; Klamath County, Oreg., western part; 2 small inflowing streams; outlet, an intermittent stream passing northeastward through Fourmile Creek to Pelican Bay on Upper Klamath Lake (outlet Klamath River, which discharges to the Pacific); this lake is 3 miles long and about 1 mile wide. Klamath sheet.

La Laguna Lake; San Diego County; northwestern part of Pueblo Lands of San Diego; outlet, a stream 1½ miles long, flowing southward into Rose Canyon Creek, which discharges to the Pacific through False Bay; altitude, 250 feet. La Jolla sheet.

Lamarck Creek; Inyo County, Inyo National Forest; rises on the east slope of the Sierra, 1 mile northwest of Mount Lamarck, at altitude 13,000 feet above sea level; flows northeastward 4 miles into North Fork of Bishop Creek (tributary through Middle Fork of Bishop Creek to Bishop Creek and thus to Owens River, which discharges to Owens Lake); fall, 3,600 feet; passes through several small lakes. Mount Goddard sheet.

Lamb Canyon Creek; Riverside County; rises in the north-central part of T. 3 S., R. 1 W., San Bernardino base and meridian, on Mount Davis, at altitude 2,500 feet above sea level; flows southwestward 4 miles to the edge of San Jacinto Valley; fall, about 1,000 feet. San Jacinto and Elsinore sheets.

Land Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends southwestward from Montezuma Slough. Antioch and Carquinez sheets.

Lang Canyon Creek; Alameda County; rises in the southern part of T. 4 S., R. 3 E., Mount Diablo base and meridian, on the south slope of Cedar Mountain Ridge, at altitude 2,850 feet above sea level; flows northwestward 1¼ miles and southwestward 1¼ miles to Arroyo del Valle (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay). Tesla sheet.

Langford Dry Lake; San Bernardino County; T. 13 N., R. 3 E., San Bernardino base and meridian, south of Garlic Dry Lake; at the southeast corner of this lake is a well about 40 feet deep. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I and p. 61.

Langs Creek; Trinity County; rises in the northwestern part of T. 4 N., R. 8 E., Humboldt base and meridian; flows east of north into Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 2 miles. Punnett's map of Trinity County.

La Paleta Valley Creek; San Diego County; rises in northern part of La Nacion Rancho, at altitude 200 feet above sea level; flows westerly and enters the Pacific through San Diego Bay just north of National City; intermittent; length, about 3 miles. San Diego sheet.

Laquina Creek; San Benito County; rises in the southeastern part of T. 18 S., R. 10 E., Mount Diablo base and meridian; flows northward into San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 5 miles. Land Office map of California, 1907.

Larribee Creek; Humboldt County; rises in the southwestern part of T. 2 S., R. 5 E., Humboldt base and meridian; flows northwestward to its junction with Eel River (tributary to the Pacific); length, 20 miles; principal tributary, Burr Creek. Punnett's map of Humbolt County. Spelled also Laribee, Larabee, Larrabee.

Larribee Creek, Little; Humboldt County; rises in the northern part of T. 1 N., R. 4 E., Humboldt base and meridian, on the north slope of Larribee Buttes; flows north of west 4 miles to its junction with Van Duzen River (trib-

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utary to Eel River, which discharges to the Pacific) near Bridgeville. Punnett's map of Humboldt County.

Las Choyas Valley Creek; San Diego County; rises near La Mesa, in the eastern part of Ex Mission San Diego Rancho, at altitude 475 feet; flows southwestward 8½ miles, and enters the Pacific through San Diego Bay 1 mile north of mouth of La Paleta Valley Creek; intermittent. La Jolla and San Diego sheets.

Las Choyas Valley Creek, South; San Diego County; rises at Lemongrove, in Ex Mission San Diego Rancho, at altitude 425 feet; flows southwestward and enters Las Choyas Valley Creek (which discharges to the Pacific through San Diego Bay) 1 mile northwest of the mouth of La Paleta Valley Creek; intermittent; length, about 6 miles; San Diego sheet.

Las Flores Canyon Creek; Los Angeles County; an intermittent stream, 3 miles long, rising in the east-central part of T. 1 S., R. 17 W., San Bernardino base and meridian, and flowing southward into Pacific Ocean. Calabasas sheet.

Las Pulgas Canyon Creek; San Diego County; rises in the northeastern part of Santa Margarita y las Flores; at altitude about 1,000 feet above sea level; flows southwestward about 11 miles and enters the Pacific 1 mile northwest of Las Flores station. San Luis Rey sheet.

Las Trampas Creek; Walnut Creek basin; Contra Costa County; rises in the central part of T. 1 S., R. 2 W., Mount Diablo base and meridian, on the west slope of Las Trampas Ridge, at altitude 1,200 feet above sea level; flows northwestward 3 miles, then in general northerly to the town of Lafayette, where it joins the Lafayette Branch of Walnut Creek (tributary through Walnut Creek to Suisun Bay); length, about 7 miles; fall, 825 feet; principal tributary, Grizzly Creek. Concord sheet.

Las Varas Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 750 feet above sea level; flows west of south 3½ miles to the point at which it enters the Pacific, one-half mile northwest of Naples. Goleta special sheet.

Las Vegas Creek; Santa Barbara County; an intermittent stream, 3 miles long, draining an area in the eastern part of Los Dos Pueblos Rancho, flowing southward, and sinking near La Patera before reaching the tidal marsh through which this part of Santa Barbara County is drained to the Pacific. Goleta special sheet.

Las Virgenes Creek; Ventura and Los Angeles counties; rises in the Simi Hills, in Ventura County at altitude 2,400 feet above sea level; flows southeastward 3 miles, then in general southerly and southwesterly 8 miles to its junction with Triunfo Creek, with which it forms Malibu Creek (tributary to the Pacific); principal tributaries, East Fork, Liberty Canyon, and Stokes Canyon creeks. Camulos sheet.

Las Virgenes Creek, East Fork; Malibu Creek basin; Ventura County; an intermittent stream, 2 miles long, flowing southwestward into Las Virgenes Creek (tributary to Malibu Creek, which discharges to the Pacific). Camulos sheet.

Las Yeguas Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, 2 miles west of south of Santa Ynez Peak, at altitude 1,000 feet above sea level; flows west of south to the point at which it enters the Pacific; length, about 3 miles. Goleta special sheet.

Latigo Canyon Creek; Los Angeles County; an intermittent stream, 2½ miles long, rising on the southern slope of the Santa Monica Mountains, in the

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southern part of T. 1. S., R. 18 W., and flowing southward and southeastward into the Pacific Ocean. Camulos sheet.

La Tuna Canyon Creek; Los Angeles County; rises in Verdugo Mountains, 3 miles northeast of Burbank, at altitude 2,500 feet above sea level; flows northward 1 mile, then westerly 5 miles toward Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific) in San Fernando Valley; fall above the edge of the valley, about 1,600 feet. Santa Monica sheet.

Laurel Canyon Creek; Los Angeles County; an intermittent stream, about 1½ miles long, draining a small area in the Santa Monica Mountains and flowing southward into Ballona Creek in La Brea Rancho. Santa Monica sheet.

Laurel Creek; San Mateo County; rises near the San Mateo County alms-house, at altitude about 600 feet above sea level; flows northeastward toward the tidal marsh at the south end of San Francisco Bay. San Mateo sheet.

Laurel Creek; Solano County; rises in Tolenas Rancho, near the south end of the Vaca Mountains, at altitude 800 feet above sea level; flows southward 7 miles into Hill Slough, in the tidal marsh on the north side of Suisun Bay. Napa sheet.

Laurel Gulch Creek; Los Angeles County; rises in the west-central part of T. 2 N., R. 8 W., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows westerly into San Gabriel River (tributary to the Pacific); length, 1½ miles; fall, 2,100 feet. San Antonio sheet.

Lauterwasser Creek; Contra Costa County; rises in the eastern part of T. 1 N., R. 3 W., Mount Diablo base and meridian; flows southwestward 2½ miles to its junction with San Pablo Creek (tributary to San Pablo Bay) near De Laveaga station. Concord sheet.

Lavic Dry Lake; San Bernardino County; T. 7 N., R. 6 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Lawlor Ravine Creek; Contra Costa County; an intermittent stream rising in the southeastern part of T. 2 N., R 1 W., Mount Diablo base and meridian, and flowing east of north toward the tidal marsh at the east end of Suisun Bay. Mount Diablo and Antioch sheets.

Lawrence Creek; Humboldt County; rises in the southwestern part of T. 4 N., R. 3 E., Humboldt base and meridian, on Iaqua Buttes; flows northwestward and westward 3 miles, then, in general, southwestward about 10 miles to its junction with Yager Creek (tributary to Van Duzen River and thus to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Lawson Creek; San Diego County; rises in the southern part of T. 16 S., R. 2 E., San Bernardino base and meridian, at altitude 2,500 feet above sea level; flows northwestward to its junction with Sweetwater River (tributary to the Pacific through San Diego Bay); length, 4 miles; fall, 1,500 feet; intermittent. Cuyamaca sheet.

La Zaca Creek; Santa Barbara County; rises on the north slope of Lookout Mountain, 1 mile northwest of Zaca Lake, at altitude 2,000 feet; flows northwest 1 mile, then southwestward about 16 miles to Santa Ynez River (tributary to the Pacific); fall, 1,650 feet. See Zaca Lake. Lompoc sheet.

La Zanja Canyon Creek; San Diego County; rises in the northwestern part of T. 14 S., R. 2 W., San Bernardino base and meridian, on the northwestern slope of Black Mountain, at altitude 800 feet above sea level; flows somewhat south of west to the southern part of the tidal marsh through which San Dieguito River enters the Pacific, through which its course is northwesterly; intermittent; length, about 9 miles. La Jolla sheet.

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Leach Dry Lake; San Bernardino County; in T. 17 N., R. 3 E., San Bernardino base and meridian, north of Leach Mountain. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Leavitt Creek; Mono County; rises in the eastern part of T. 5 N., R. 21 E., Mount Diablo base and meridian, on the east slope of Leavitt Peak, at altitude 10,200 feet above sea level; flows northeastward to its junction with West Walker River (tributary to Walker River, which discharges to Walker Lake) in Leavitt Meadow; length, about 6 miles; fall, 3,100 feet. Dardanelles sheet.

Lechuza Canyon Creek; Los Angeles County; rises in the central part of T. 1 S., R. 19 W., San Bernardino base and meridian; flows west of south 3 miles into the Pacific Ocean. Camulos sheet.

Leckler Canyon Creek; Los Angeles and Ventura counties; an intermittent stream, 2 miles long, rising in the northwestern part of T. 5 N., R. 17 W., San Bernardino base and meridian, and flowing northwestward into Santa Felicia Canyon Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Ledgewood Creek; Napa and Solano counties; rises in the southern part of T. 6 N., R. 2 W., Mount Diablo base and meridian, on the west slope of the Vaca Mountains, at altitude 1,000 feet above sea level; flows west of south to a point near Manka, then southeastward into the tidal marsh on the north side of Suisun Bay; length, about 10 miles. Napa sheet.

Lee Lake; Riverside County; formed by a dam across Temescal Creek (tributary to Santa Ana River, which discharges to the Pacific); altitude, about 1,150 feet. Elsinore sheet.

Leevining Creek; Mono County; rises in the northeastern part of T. 1 N., R. 24 E., Mount Diablo base and meridian, in a glacier on the northeast slope of Conness Mountain; flows northeastward to the head of Saddlebag Lake through which it flows southeastward to Ellery Lake, then irregularly eastward and northeastward to the point at which it enters Mono Lake; length, about 16 miles; total fall, about 5,000 feet; principal tributaries, Glacier Canyon Creek and Warren Fork. Gaging station near Mono Lake (1910–1912). Mount Lyell sheet.

Le Montaine Creek; Los Angeles County; rises in the southeastern part of T. 4 N., R. 8 W., San Bernardino base and meridian; flows northward to the Mohave Desert into which it sinks; intermittent. San Antonio sheet.

Leon Canyon Creek; Ventura County; an intermittent stream, 2 miles long, flowing northwestward into Canada Larga (tributary to Ventura River, which discharges to the Pacific). Santa Paula sheet.

Leonard Lake; Mendocino County; northeastern part of T. 16 N., R. 14 W., Mount Diablo base and meridian; outlet, Mill Creek to Forsythe Creek (tributary to Russian River, which discharges to the Pacific). Punnett's map of Mendocino County.

Leviathan Creek; Alpine County; rises about 2 miles southwest of Leviathan Peak, at altitude 8,050 feet; flows west of north 3 miles, then northeastward 2 miles to its junction with Mountaineer Creek to form Bryant Creek (tributary through East Fork of Carson River to Carson River, which discharges to Carson Sink); fall, about 1,800 feet. Markleeville sheet.

Lewis Canyon Creek; Santa Barbara County; an intermittent stream, 1½ miles long, rising on the northern slope of the Santa Ynez Mountains, in T. 5 N., R. 28 W., San Bernardino base and meridian, and flowing northward to Santa Ynez River, which discharges to the Pacific. Santa Ynez sheet.

Lewis Creek; San Benito County; rises in the northern part of T. 19 S., R. 11 E., Mount Diablo base and meridian, 3 miles southeast of Lookout Mountain; flows southward 8 miles, then turns abruptly and flows northwestward

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14 miles to its junction with Bitterwater Creek (tributary through San Lorenzo Creek to Salinas River, which discharges to the Pacific through Monterey Bay); principal tributaries, Priest Valley and Oat Canyon creeks. Land Office map of California, 1907.

Lewis Paul Canyon Creek; Los Angeles County; an intermittent stream, 1½ miles long, rising in the north-central part of T. 1 N., R. 9 W., San Bernardino base and meridian, and flowing east of south into Big Dalton Canyon (tributary to San Gabriel River, which discharges to the Pacific). Pomona sheet.

Lewis Valley Creek; Riverside County; Santa Margarita River basin; a southwestward flowing stream draining the western part of T. 7 S., and the northwest corner of T. 8 S., R. 1 E., San Bernardino base and meridian. The stream is about 6 miles long and is indicated on the San Jacinto sheet as permanent in a part of its course.

Lexington Wash; Los Angeles County; San Gabriel River basin; the Pasadena sheet shows a stream in this wash flowing southwestward to Rio Hondo.

Liberty Canyon Creek; Los Angeles County; an intermittent stream, 2 miles long, flowing southeastward into Las Virgenes Creek (tributary to Malibu Creek, which discharges to the Pacific). Camulos sheet.

Liddell Creek; Santa Cruz County; a stream, about 3 miles long, rising in the southeastern part of T. 10 S., R. 3 W., Mount Diablo base and meridian, and flowing southwestward into the Pacific 2 miles southeast of Davenport; tributary, East Branch. Santa Cruz sheet.

Liddell Creek, East Branch; Santa Cruz County; rises in the southeastern part of T. 10 S., R. 3 W., Mount Diablo base and meridian; flows southwestward into Liddell Creek, which discharges to the Pacific. Santa Cruz sheet.

Liebre Gulch Creek; Los Angeles County; rises in the southwestern part of T. 8 N., R. 17 W., San Bernardino base and meridian, on the northwestern slope of Liebre Mountain, at altitude 4,500 feet above sea level; flows southwestward 7 miles to its junction with Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) fall, 2,200 feet; principal tributary, West Fork; intermittent. Tejon sheet.

Liebre Gulch, West Fork; Los Angeles County; rises in the southeastern part of T. 8 N., R. 18 W., San Bernardino base and meridian, at altitude 3,700 feet above sea level; flows southward into Liebre Gulch (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific); length, about 6 miles; fall, 1,400 feet; intermittent. Tejon sheet.

Lime Canyon Creek; Ventura County; an intermittent stream, 1½ miles long, rising in the southwestern part of T. 5 N., R. 18 W., San Bernardino base and meridian, and flowing southeastward to Piru Creek (tributary to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Limekiln Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream rising in the Santa Susana Mountains, in T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing southward to San Fernando Valley. Santa Susana sheet.

Limekiln Creek; Monterey County; an intermittent stream flowing northeastward into Salinas River (which discharges to the Pacific through Monterey Bay) 4½ miles northwest of Gonzales. Map of Salinas Valley, sheet 1.

Lindero Canyon Creek; Ventura and Los Angeles counties; an intermittent stream, about 6 miles long, flowing southward and southeastward into Medea Creek (tributary through Triunfo to Malibu Creek, which discharges into the Pacific Ocean). Camulos sheet.

Lindo Lake; San Diego County; at Lakeside, one-half mile west of San Diego River (tributary to the Pacific through False Bay); neither inlet nor outlet shown on map. Cuyamaca sheet.

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Lindsey Creek; Humboldt County; rises in the central part of T. 7 N., R. 1 E., Humboldt base and meridian; flows east of south about 6 miles to its junction with Mad River (tributary to the Pacific) near Vance. Punnett's map of Humboldt County.

Link River; Klamath County, Oreg.; the stretch of Klamath River lying between Upper Klamath Lake and Lake Ewauna. The fall of this river between the lake and Lake Ewauna is about 56 feet. Klamath sheet.

Lion Canyon Creek; San Juan Creek basin; Orange and Riverside counties: an intermittent stream, 4 miles long, rising in the western part of T. 6 S., R. 5 W., San Bernardino base and meridian, and flowing west of south into San Juan Creek; fall, 1,900 feet. Elsinore sheet.

Lion Canyon Creek; Santa Clara River basin; Ventura County; rises in the western part of T. 5 N., R. 21 W., San Bernardino base and meridian, at altitude 5,000 feet above sea level; flows northwestward to its junction with Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 5 miles; fall, 2,000 feet. Mount Pinos sheet.

Lion Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 2 miles long, rising on the north slope of the San Rafael Mountains in the southern part of T. 9 N., R. 30 W., San Bernardino base and meridian, and flowing northeastward to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Lion Canyon Creek; Ventura River basin; Ventura County; rises in the eastern end of Upper Ojai Valley, on the north slope of Sulphur Mountain, at altitude 1,450 feet above sea level; flows in general south of west to its junction with San Antonio Creek through which it is tributary to Ventura River (tributary to the Pacific); length, 8 miles; fall, 900 feet, of which 600 feet is made in about 4 miles in the canyon. Santa Paula sheet.

Lion Creek; San Diego County; southeastern part of T. 9 S., R. 1 W., San Bernardino base and meridian. The drainage line is not indicated on the map (Ramona sheet), but the contours indicate a stream, about a mile long, passing to the southwest and south into Pauma Creek (tributary to San Luis Rey River, which discharges to the Pacific); intermittent.

Lisque Creek; Santa Barbara County; an intermittent stream, 3 miles long, flowing southeastward to Santa Agueda Creek, which discharges to Santa Ynez River (tributary to the Pacific). Lompoc sheet.

Little Creek; Scott Creek basin; Santa Cruz County; rises in the western part of San Vicente Rancho, at altitude 1,500 feet above sea level; flows southwestward 3 miles into Scott Creek, which discharges to the Pacific; fall, about 1,400 feet. Santa Cruz sheet.

Little Gulch Creek; Siskiyou County; rises in the southern part of T. 47 N., R. 7 W., Mount Diablo base and meridian, on the southwest slope of Ash Peak; flows southwestward 3 miles into Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

Little Lake; San Gabriel River basin; Los Angeles County; 1 mile east of San Gabriel River in Santa Gertrudis Rancho. Downey sheet.

Little River; Humboldt County; rises in the eastern part of T. 7 N., R. 2 E., Humboldt base and meridian, on Humboldt Mountain; flows northwestward about 6 miles, then in general south of west 8 miles to the northwestern part of T. 7 N., R. 1 E., where it enters the Pacific, 3 miles southeast of Trinidad Point. Punnett's map of Humboldt County.

Little River; Mendocino County; rises in the northeastern part of T. 16 N., R. 17 W., Mount Diablo base and meridian; flows westward and enters the Pacific at the town of Little River; length, 5 miles. Punnett's map of Mendocino County.

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Little. *See also* significant name.

Liveoak Creek; Los Angeles County; rises in the central part of T. 1 N., R. 8 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows west of south about 4 miles; discharges into the valley of Santa Ana River (tributary to the Pacific) about 4 miles north of Pomona; fall above the mouth of the canyon, 2,000 feet; intermittent. Cucamonga sheet.

Llagas Creek; Santa Clara County; rises in the western part of T. 9 S., R. 1 E., Mount Diablo base and meridian; flows in general southeastward to its junction with Pachecho Creek (tributary to Pajaro River, which discharges to the Pacific in Monterey Bay) in the central part of T. 11 S., R. 4 E.; length, about 30 miles. Land Office Map of California, 1907.

Llanito Creek; Santa Barbara County; an intermittent stream, 1 mile long, flowing southward to El Callejon Creek, the head of El Jaro Creek, which is tributary to Santa Ynez River (tributary to the Pacific) through Salsipuedes Creek. Lompoc sheet.

Lobdel Lake; Mono County; western part of T. 7 N., R. 24 E., Mount Diablo base and meridian, in Swamp Meadows; fed by a ditch which takes water from Deep Creek; outlet, Desert Creek to Smith Valley on West Water River; altitude, 9,250 feet. Bridgeport sheet.

Lobe Canyon Creek; Los Angeles County; an intermittent stream, 3 miles long, flowing northeastward into Triunfo Creek (tributary to Malibu Creek, which discharges to the Pacific). Camulos sheet.

Lobitos Creek; San Mateo County; a stream about 5 miles long, draining a small area in Canada Verde y Arroyo de la Purisima Rancho, and flowing southwestward into the Pacific 2 miles southeast of the mouth of Purisima Creek. Santa Cruz sheet.

Lobos Creek; San Francisco County; a small creek flowing westward and northward from a point near the Marine Hospital to the Pacific through Golden Gate. San Francisco sheet.

Lock Creek; San Mateo County; rises in the southwestern part of T. 4 S., R. 5 W., Mount Diablo base and meridian, on the west slope of the Montara Mountains, at altitude 1,600 feet above sea level; flows southwestward 1 mile and southeastward 1 mile into Frenchman Creek, which discharges to the Pacific; fall, 1,300 feet. San Mateo and Santa Cruz sheets.

Lockwood Creek; Ventura County; rises in the western part of T. 7 N., R. 21 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows northeastward to Lockwood Valley, then eastward along the south side of the valley, and finally southeastward through its canyon to join Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 9 miles; fall, 1,600 feet; principal tributaries, North and Middle forks, Bitter, and Seymour creeks. Mount Pinos sheet.

Lockwood Creek, Middle Fork; Ventura County; rises in the extreme northeastern part of T. 8 N., R. 22 W., San Bernardino base and meridian, on the western slope of Mount Pinos, at altitude 8,000 feet above sea level; flows southeastward to Lockwood Valley, which is drained by Lockwood Creek to Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); fall in the 4 miles above the mouth of the canyon, 2,500 feet; intermittent. Mount Pinos sheet.

Lockwood Creek, North Fork; Ventura County; rises in the northeastern part of T. 8 N., R. 22 W., San Bernardino base and meridian, on the south slope of Sawmill Mountain, at altitude 8,000 feet above sea level; flows southeastward to the western edge of Lockwood Valley, where its waters sink; Lockwood Valley drains eastward through Lockwood Creek which flows into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); length, above

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mouth of canyon, about 4 miles; fall, 2,400 feet; intermittent. Mount Pinos sheet.

Loftus Canyon Creek; Ventura County; opening northeastward to Santa Clara River (tributary to the Pacific) in the northwestern part of T. 3 N. R. 20 W., San Bernardino base and meridian. Santa Paula sheet.

Loma Alta Creek; San Diego County; rises in the eastern part of T. 11 S., R. 4 W., San Bernardino base and meridian, at altitude 400 feet above sea level; flows southwestward and discharges into the brackish-water marsh near South Oceanside; intermittent; length to head of marsh, about 5 miles. This marsh is separated from the Pacific by a narrow sand bar which may at times be cut through by the flood waters of the creek. Escondido and Oceanside sheets.

Lompico Creek; Santa Cruz County; rises in the eastern part of T. 9 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows somewhat west of south to its junction with Zayante Creek (tributary to San Lorenzo River, which discharges to the Pacific); fall, about 1,100 feet. Santa Cruz sheet.

Lone Willow Dry Lake; San Bernardino County; between the Slate Range and Brown Mountain. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I and p. 44, on which Lone Willow Spring is described.

Lonely Gulch Creek; Eldorado County; rises in the southwestern part of T. 14 N., R. 17 E., Mount Diablo base and meridian, at altitude 7,000 feet above sea level; flows northeastward 1½ miles into Rubicon Bay, Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); fall, about 775 feet. Truckee sheet.

Lone Pine Creek; Inyo County; rises on the east slope of the Sierra in the region just east of Mount Russell (altitude, 14,190 feet), Mount Whitney (altitude, 14,501 feet), and Mount Muir (altitude, 14,025 feet); flows somewhat north of east 12 miles to the edge of Owens Valley near Lone Pine, where its waters sink; the headwaters extend to nearly 13,000 feet above sea level and the total fall is more than 9,000 feet, of which 6,500 feet is made in the first 5 miles; upper basin contains a number of small lakes. Gaging station near Lone Pine (1906–1911). Mount Whitney sheet.

Long Branch Creek; Santa Clara County; an intermittent stream, 3 miles long, rising in the western part of T. 6 S., R. 3 E., Mount Diablo base and meridian, and flowing east of south into Isabel Creek (tributary through Arroyo Hondo to Calaveras Creek and thus through Alameda Creek to San Francisco Bay); fall, 1,250 feet. Mount Hamilton sheet.

Long Canyon Creek; Calleguas Creek basin; Ventura County; an intermittent stream, about 6 miles long, rising in the southeastern part of T. 3 N., R. 20 E., and flowing southwesterly into Arroyo Las Posas (Calleguas Creek, which discharges to the Pacific); intermittent. Camulos sheet.

Long Canyon Creek; San Juan Canyon Creek basin; Orange and Riverside counties; rises about 2 miles east of Los Pinos Peak near the Old Dominion mine, at altitude 2,900 feet above sea level; flows southeastward about 3 miles into San Juan Canyon Creek (tributary to the Pacific); intermittent. Elsinore sheet.

Long Canyon Creek; Santa Margarita River basin; San Diego and Riverside counties; T. 9 S., R. 1 E., San Bernardino base and meridian; rises on the western slope of Palomar Mountain (altitude, 6,126 feet); flows northwestward into Temecula Creek (Santa Margarita River, which discharges to the Pacific); length, about 7 miles; fall, 3,900 feet. Ramona sheet.

Long Canyon Creek; Sweetwater River basin; San Diego County; rises in the southern part of T. 17 S., R. 1 W., San Bernardino base and meridian, at altitude 500 feet above sea level; flows northwestward into Sweetwater

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River (tributary to the Pacific through San Diego Bay); length, about 3 miles; fall, 400 feet; intermittent. Cuyamaca and San Diego sheets.

Long Creek; Klamath County, Oreg.; rises on Yam Say Peak; flows southeastward and eastward into Sycan Marsh, which is drained by Sycan River to Sprague River (tributary through Williamson River to Upper Klamath Lake and thus to Klamath River, which discharges to the Pacific); length above the marsh, about 12 miles. Klamath sheet.

Long Grade Canyon Creek; Ventura County; an intermittent stream, about 3 miles long, flowing north of west toward Calleguas Creek, which discharges to the Pacific. Hueneme sheet.

Long Lake; Inyo County; Inyo National Forest; on west slope of Inconsolable Range; outlet, South Fork of Bishop Creek (tributary through Bishop Creek to Owens River, which discharges into Owens Lake); altitude, 10,800 feet. Mount Goddard sheet.

Long Pine Canyon Creek; San Bernardino County; drains portions of T. 3 N., Rs. 6 and 7 W., San Bernardino base and meridian, and an area lying between the North Fork of Lytle Creek and Cajon Canyon, through which it is tributary to the Santa Ana (tributary to the Pacific). The canyon is about 9 miles long. Hesperia and San Antonio sheets.

Long Valley Creek; Eel River basin; Mendocino County; rises in the central part of T. 20 N., R. 15 W., Mount Diablo base and meridian; flows northward 1 mile, northeastward 1 mile, then southeastward 5 miles to its junction with Deep Creek (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Long Valley Creek; Honey Lake basin; rises in Sierra County in the northern part of T. 10 N., R. 18 E., Mount Diablo base and meridian, at altitude about 7,000 feet above sea level; takes a general northerly course and discharges into Honey Lake, which is without outlet; length, about 45 miles; fall, about 3,050 feet, of which 1,500 feet is made in the first 3 miles; intermittent; in times of flood discharges considerable water into Honey Lake (q. v.). Sierraville and Honey Lake sheets.

Long Valley Creek; Walker River basin; Mono County; rises in the northeastern part of T. 5 N., R. 23 E., Mount Diablo base and meridian, at altitude 8,500 feet; takes a general easterly course to its junction with Swager Creek (tributary through Buckeye Creek to East Walker River and thus to Walker River, which discharges to Walker Lake) at the lower end of Huntoon Valley; length, about 6 miles; fall, 1,700 feet. Bridgeport sheet.

Lopez Canyon Creek; Los Angeles County; Los Angeles River basin; an intermittent stream, about 2 miles long, flowing southwestward into San Fernando Valley 2 miles west of the mouth of Little Tujunga Canyon. Fernando sheet.

Los Alamos Canyon Creek; Riverside County; rises at the southeast end of Elsinore Mountains, at altitude 2,350 feet above sea level; flows southwestward 4 miles, then westward 3 miles to its junction with San Mateo Creek, which discharges to the Pacific; fall, 1,000 feet; principal tributary, Wildhorse Canyon Creek; intermittent. Elsinore sheet.

Los Alamos Creek; Sonoma County; rises in the northwestern part of T. 7 N., R. 6 W., Mount Diablo base and meridian; flows southwestward 4 miles and unites with Santa Rosa Creek (tributary to Russian River, which flows into the Pacific) near Melitta in Rancho Los Guilicos. Punnett's map of Sonoma County.

Los Amoles Creek; Santa Barbara County; an intermittent stream, 2½ miles long, rising in the southern part of San Julian Rancho and flowing

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northward to El Jaro Creek (tributary through Salsipuedes Creek to Santa Ynez River, which discharges to the Pacific). Lompoc sheet.

Los Angeles River; Los Angeles County; formed by Tujunga, Pacoima, and other small creeks whose sources are in the Sierra Madre northeast of the city of Los Angeles. These streams leave the mountains at a point about 25 miles above the city and enter the comparatively flat country of the San Fernando Valley where, except at times of excessive floods, the waters disappear in the sand and gravel washes at the lower end; in this valley is a secondary range of hills, trending from east to west, where bed-rock obstruction forces the water to the surface to form what is known as Los Angeles River. Below this point the river flows through the flat country of the Los Angeles Valley and enters the Pacific near the town of Long Beach. At the city of Los Angeles it is joined by Arroyo Seco. During the summer months the entire flow of Los Angeles River is diverted at a point about 5 miles above Los Angeles for the supply of the city and, except during flood periods, only a small amount of water passes this point. Tujunga, Pasadena, Santa Monica, and Downey sheets; Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 51.

Los Berros Creek; San Luis Obispo County; rises in T. 32 S., R. 14 E., Mount Diablo base and meridian; flows southward and southwestward to a point east of Los Berros, northwestward to Nopomo Hill, then southwestward, westward, and northwestward again to a point near Oceano where it joins Arroyo Grande Creek (tributary to the Pacific); length, about 11 miles; intermittent; from Los Berros to Nopomo Hill the valley of the creek is followed by the Pacific Coast Railway. Arroyo Grande sheet.

Los Coches Creek; San Diego County; rises in the eastern part of T. 15 S., R. 1 E., San Bernardino base and meridian, at altitude 1,100 feet above sea level; flows southwestward 4 miles, then northwestward about 3 miles to its junction with San Diego River, which discharges to the Pacific through False Bay; intermittent; fall, 700 feet. Cuyamaca sheet.

Los Gatos Creek; Carmelo River basin; Monterey County; rises in the northern part of T. 18 S., R. 3 E., Mount Diablo base and meridian; flows northward into Glicko Creek (tributary to Carmelo River, which discharges to the Pacific); length, about 8 miles. Post route map, 1911; Land Office map, 1907, on which it is shown but not named.

Los Gatos Creek; Guadalupe River basin; Santa Clara County; an intermittent stream, about 8 miles long, flowing northwestward and joining Guadalupe River (tributary to San Francisco Bay) in the city of San Jose. San Jose sheet.

Los Laureles Canyon Creek; Santa Barbara County; an intermittent stream, 4 miles long, rising on the north slope of the Santa Ynez Mountains in T. 5 N., R. 28 W., San Bernardino base and meridian, and flowing northwestward to Santa Ynez River, which discharges to the Pacific. Santa Ynez sheet.

Los Osos Creek; San Luis Obispo County; rises in the northern part of T. 31 S., R 11 E., Mount Diablo base and meridian, at altitude 900 feet above sea level; flows northwestward to the western part of Canada de los Osos Rancho, then turns sharply and flows northeastward to the tidal marsh through which it flows to Morro Bay and thus to the Pacific Ocean; upper course lies through Clark Valley; length, about 9 miles. Cayucos sheet.

Los Penasquitos Canyon Creek; San Diego County; rises in the northern part of T. 14 S., R. 1 W., San Bernardino base and meridian, at altitude 2,100 feet above sea level; flows in general somewhat south of west to a point near Sorrento at upper end of Soledad Valley, where it turns and flows northwestward through the valley and enters the Pacific through a tidal marsh 1 mile southeast of Delmar; intermittent; length, about 22 miles; principal tributary,

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Soledad Canyon Creek. McGonigle Canyon Creek enters the Pacific through the same tidal marsh. Elcajon and La Jolla sheets.

Los Pinetos Canyon; Los Angeles County; northern part of T. 3 N., R. 15 W., San Bernardino base and meridian; a drainage way opening northward into Placerita Canyon, which discharges through Placerita Creek to Santa Clara River (tributary to the Pacific). Fernando sheet.

Los Sauces Creek; Ventura County; an intermittent stream rising in the southern part of T. 4 N., R. 24 W., San Bernardino base and meridian, at altitude 1,500 feet above sea level, and flowing west of south to the Pacific Ocean half a mile northwest of Seacliff; tributary, Poverty Canyon Creek. Ventura sheet.

Lost Cannon Creek; Mono County. *See* Lost Canyon Creek.

Lost Canyon Creek; Mono County; rises in the southeastern part of T. 7 N., R. 22 E., Mount Diablo base and meridian, at altitude 8,700 feet above sea level; flows northwestward 3 miles, then northeastward 7 miles to its junction with West Walker River (tributary to Walker River, which discharges to Walker Lake) at the upper end of Antelope Valley; fall, 3,400 feet; principal tributary, Mill Creek; called Lost Cannon Creek on Dardanelles sheet. Dardanelles, Bridgeport, and Wellington sheets.

Lost Creek; San Bernardino County; rises in the southwestern part of T. 1 N., R. 2 E., San Bernardino base and meridian, 2 miles northeast of San Gorgonio Mountain, at altitude 9,500 feet above sea level; flows northerly to its junction with Santa Ana River (tributary to the Pacific); length, 4 miles; fall, 3,200 feet; intermittent. San Gorgonio sheet.

Los Trancos Creek; San Francisquito Creek basin; forms boundary between San Mateo and Santa Clara counties; rises in the southern part of El Corte de Madero Rancho, at altitude 1,000 feet above sea level; flows northerly into San Francisquito Creek, which discharges to San Francisco Bay; length, about 3 miles. Santa Cruz and Palo Alto sheets.

Lost River; Modoc County, Cal., and Klamath County, Oreg.; rises in the southeastern part of Klamath County, Oreg.; flows southwestward into Modoc County, Cal., then passing to the west and northwest reenters Oregon, and finally discharges into Rhett Lake; principal tributaries, Willow Creek and a stream from Clear Lake; formerly connected by a slough with Klamath River, but such discharge has been artificially prevented. Gaging station near Clear Lake (1904–1909). Alturas, Modoc Lava Bed, and Klamath sheets. *See also* Water-Supply Paper U. S. Geol. Survey No. 146, 1905, p. 98.

Love Creek; Santa Cruz County; rises in the central part of T. 9 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,000 feet above sea level; flows southward 3 miles into San Lorenzo River at Ben Lomond (tributary to the Pacific); fall, about 700 feet. Santa Cruz sheet.

Lower Lake. *See* Alkali Lakes.

Lucas Canyon Creek; Riverside and Orange counties; an intermittent stream, about 6 miles long, rising 1 mile southwest of Sitton Peak, and flowing southwesterly into San Juan Canyon Creek; fall, 2,300 feet. Elsinore and Corona sheets.

Lucas Creek; Los Angeles County; rises on the east slope of Josephine Mountain, in the San Gabriel Timber Land Reserve, at altitude 4,400 feet above sea level; flows northwestward about 2 miles into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); fall, 1,950 feet. Tujunga sheet.

Lucky Creek; Humboldt County; rises in the western part of T. 7 N., R. 4 E., Humboldt base and meridian; flows northwestward 8 miles to its junction with

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Redwood Creek (tributary to the Pacific) in the western part of T. 8 N., R. 3 E. Punnett's map of Humboldt County.

Lucol Hollow Creek; Solano County; an intermittent stream, 3 miles long, rising in the Montezuma Hills and flowing southwestward and westward into Hopkins Ravine Creek, which discharges into the tidal marsh on the north side of Suisun Bay. Antioch sheet.

Lumgrey Creek; Siskiyou County; rises in the northeastern part of T. 47 N., R. 8 W., Mount Diablo base and meridian, on the south slope of Mount Bullion; flows southwestward 8 miles into Klamath River (tributary to the Pacific), which it enters 2 miles east of the mouth of Beaver Creek. Punnett's map of Siskiyou County.

Lundy Canyon Creek. *See* Mill Creek.

Lundy Lake; Mono County; north-central part of T. 2 N., R. 25 E., Mount Diablo base and meridian; inlet, Mill Creek, which flows through the lake to Mono Lake; altitude, 7,766 feet; fall of Mill Creek in the 6 miles below the lake, 1,340 feet. Bridgeport sheet.

Lyons Creek; San Diego County; a small stream, unnamed on the map (Cuyamaca sheet), which enters Cottonwood Creek (tributary to Tia Juana River, which discharges to the Pacific) about half a mile above the Barrett dam.

Lytle Creek; San Bernardino County; formed in the central part of T. 2 N., R. 6 W., San Bernardino base and meridian, by the union of its North, Middle, and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises on the southeastern slope of Pine Mountain, at altitude 8,250 feet above sea level; flows southeastward 11 miles, then west of south 1½ miles to the point at which it receives the Middle Fork. The South Fork enters one-half mile below the junction of the North and Middle forks; below the forks the creek flows southeasterly through Lytle Canyon to San Bernardino Valley, which is drained by Santa Ana River (tributary to the Pacific). The drainage basin comprises about 55 square miles. All of the ordinary summer flow of the stream is diverted at the mouth of its canyon into a masonry canal and passes over a weir, canal and weir being used in common by all the water companies interested in the supply. San Antonio, Hesperia, Cucamonga, and San Bernardino sheets; Twentieth Ann. Report U. S. Geol. Survey, pt. 4, 1900, p. 555.

Lytle Creek, Middle Fork; San Bernardino County; rises in northeastern part of T. 2 N., R. 7 W., San Bernardino base and meridian, at altitude 7,250 feet; flows southeastward to junction with Lytle Creek (tributary to Santa Ana River, which discharges to the Pacific); length, 7 miles; fall, 4,250 feet; principal tributary, a stream draining the north slope of Cucamonga Peak. San Antonio and Cucamonga sheets.

Lytle Creek, North Fork. *See* Lytle Creek.

Lytle Creek, South Fork; San Bernardino County; rises in the southeastern part of T. 2 N., R. 7 W., San Bernardino base and meridian, 1 mile east of Cucamonga Peak, at altitude 7,750 feet above sea level; flows southeastward 1½ miles, then north of east about 4 miles to its junction with Lytle Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 4,900 feet. Cucamonga sheet.

McAdams Creek, Siskiyou County. *See* Cherry Creek.

McDonald Canyon Creek; Ventura County; an intermittent stream, 3 miles long, rising in the southeastern part of T. 5 N., R. 23 W., San Bernardino base and meridian, and flowing southwestward to Ventura River (tributary to the Pacific) in Ojai Valley. Ventura sheet.

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McCoy Creek; San Benito County; rises in the northern part of T. 17 S., R. 10 E., Mount Diablo base and meridian; flows east of south into San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 5 miles. Land Office map of California, 1907.

McDowell Creek; Mendocino County; rises on the west slope of the Coast Range in the northeastern part of T. 13 N., R. 11 W., Mount Diablo base and meridian; flows southwestward 6 miles to its junction with Russian River (tributary to the Pacific) in Rancho de Sanel. Punnett's map of Mendocino County.

McGarvey Creek; Del Norte County; rises in the southeastern part of T. 13 N., R. 1 E., Humboldt base and meridian; flows northward 2 miles into Klamath River (tributary to the Pacific). Punnett's map of Del Norte County.

McGee Creek; Inyo County; Inyo National Forest; rises on the north slope of Mount Humphreys, at altitude 12,000 feet above sea level; flows northeastward to its junction with Birch Creek (tributary to Owens River, which discharges to Owens Lake); fall, 7,600 feet. Mount Goddard and Bishop sheets.

McGee Creek; Mono County; Inyo National Forest; rises on the east slope of Red and White Mountain at altitude about 11,500 feet above sea level; flows northeastward. The area north of the Mount Goddard quadrangle, on which the head of this creek is shown, has not yet been mapped by the Geological Survey and the creek is not shown on the Land Office map of California; it is therefore not known to the compiler whether it is tributary to Owens River through Rock Creek or enters the river direct.

McGonigle Canyon Creek; San Diego County; rises in the northwestern part of T. 14 S., R. 2 W., San Bernardino base and meridian, on Black Mountain, at altitude 1,100 feet above sea level; flows southwestward to the tidal marsh through which Los Penasquitos Canyon Creek enters the Pacific; length, about 9 miles. La Jolla sheet.

Mack Canyon Creek; Mono County; rises in the northeastern part of T. 6 N., R. 24 E., Mount Diablo base and meridian, at altitude 9,400 feet above sea level; takes a general southerly course to its junction with Swager Creek (tributary through Buckeye Creek to East Walker River and thus to Walker River which discharges to Walker Lake); length, about 4 miles; fall, 2,500 feet. Bridgeport sheet.

McKinney Creek; Klamath River basin; Siskiyou County; rises in the northern part of T. 45 N., R. 9 W., Mount Diablo base and meridian; flows northward into Klamath River (tributary to the Pacific); length, 5 miles. Punnett's map of Siskiyou County.

McKinney Creek; Truckee River basin; Placer County; rises in the central part of T. 14 N., R. 16 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows south of east 2 miles, then northeastward 2 miles and enters Lake Tahoe (outlet through Truckee River to Pyramid and Winnemucca lakes) at McKinney; fall, 1,775 feet. Truckee sheet.

McNab Creek; Mendocino County; rises in the southwestern part of T. 14 N., R. 12 W., Mount Diablo base and meridian; flows somewhat south of east 6 miles to its junction with Russian River (tributary to the Pacific) near Largo in Rancho de Sanel. Punnett's map of Mendocino County.

Mad River; Trinity and Humboldt counties; rises in Trinity County, in the east-central part of T. 26 N., R. 12 W., Mount Diablo base and meridian; flows northwestward to the northeastern part of T. 6 N., R. 1 W., Humboldt base and meridian, where it enters the Pacific; length, including major windings, about 90 miles. The basin is very narrow and tributaries are unimportant; those named on the map are Pilot, Deer, Shower, Bug, Boulder, Maple, Canon, and Lindsey creeks, and North Fork of Mad River. In the upper parts of its course the chan-

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nel is practically dry during the summer months, the water standing in pools. Farther down flow continues throughout the year but is insufficient to irrigate all the land that is improved; during the rainy season the river is turbulent.

The lower course of the stream passes through the famous redwood belt. The remainder of the basin is covered with grass and scrubby timber.

Gaging station near Arcata (1910–1912).

Authorities: Punnett's maps of Trinity and Humboldt counties; Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 177.

Mad River, North Fork; Humboldt County; rises in the west-central part of T. 7 N., R. 2 E., Humboldt base and meridian; flows east of south 6 miles, south and southwest 4 miles, then northwestward 1 mile to its junction with Mad River (tributary to the Pacific) 1 mile west of Korbel. Punnett's map of Humboldt County.

Madden Creek; Placer County; rises in the northeastern part of T. 14 N., R. 16 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows northeastward 2¼ miles into McKinley Bay, Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); fall, 2,075 feet. Truckee sheet.

Maddon Creek; Humboldt County; rises in the southeastern part of T. 6 N., R. 4 E., Humboldt base and meridian; flows northeastward 4½ miles into the South Fork of Trinity River just above the junction of the South Fork with Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Madera Creek; Santa Clara County; rises in La Purisima Concepcion Rancho; flows northeastward toward the tidal marsh at the southern end of San Francisco Bay; sinks near Mayfield. Palo Alto and Santa Cruz sheets.

Madranio Canyon Creek; an intermittent stream rising in the northern part of T. 3 N., R. 24 W., at altitude 1,250 feet above sea level; flows southwestward toward the Pacific Ocean. Ventura sheet.

Magnesia Spring Canyon; Riverside County; central part of T. 5 S., R. 5 E., San Bernardino base and meridian; an intermittent stream, 2 miles long, flowing northeastward to Magnesia Spring, on the edge of Coachella Valley, in the Colorado Desert. Indio special sheet.

Malibu Creek; Ventura and Los Angeles counties; an intermittent stream formed in the northeastern part of T. 1 S., R. 18 W., San Bernardino base and meridian, by the union of Triunfo and Las Virgenes creeks; Triunfo Creek, which drains the larger area and is therefore considered the continuation of Malibu Creek, rises in Ventura County, 1 mile north of Triunfo Pass, on Sandstone Peak (altitude 3,059 feet); takes a very irregular but in general southeasterly course to its point of junction with Las Virgenes Creek. Below this junction Malibu Creek flows southeastward into the Pacific Ocean. Length of Triunfo Creek above the point of junction, about 16 miles; of Malibu Creek below the junction, about 6 miles. The principal tributary of Malibu Creek below the mouth of Las Virgenes is Cold Creek. Gaging station on Triunfo Creek near Calabasas (1903–1906) and on Malibu Creek near Calabasas (1903–1906). Cámulos and Calabasas sheets.

Mallard Slough; Contra Costa County; in the tidal marsh on the south side, east end of Suisun Bay. Antioch sheet.

Mallo Pass Creek; Mendocino County; rises in the northern part of T. 13 N., R. 16 W., Mount Diablo base and meridian; flows north of west, and enters the Pacific half a mile southwest of Newhaven; length, about 4½ miles. Punnett's map of Mendocino County.

Mammoth Lakes; Mono County; north of Mammoth Crest, in T. 4 S., R. 27 E., Mount Diablo base and meridian; a group of small lakes discharging by a stream flowing eastward into Owens River (tributary to Owens Lake) in Long

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Valley. The highest of the lakes is about 9,550 feet above sea level; the lowest is about 8,550. Mount Lyell sheet; Land Office map of California, 1907.

Man Gulch Creek; Alameda County; rises in the west-central part of T. 5 S., R. 4 E., Mount Diablo base and meridian, just south of the boundary line between Santa Clara and Alameda counties, on the north slope of Eylar Mountain; flows northward to Man Ridge, then turns to the west and southwest and joins Arroyo del Valle (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay) in the eastern part of T. 5 S., R. 3 E.; length, about 5 miles; fall, 2,300 feet. Tesla and Mount Hamilton sheets.

Mandiville Canyon Creek. *See* Santa Monica Canyon Creek.

Manuel Canyon Creek; Ventura County; an intermittent stream, 2 miles long, flowing westward into Canada Larga just above its entrance into Ventura River (tributary to the Pacific). Ventura sheet.

Manzana Creek; Santa Barbara County; an intermittent stream rising in the San Rafael Mountains, between San Rafael and McKinley mountains, at altitude about 5,800 feet above sea level, and flowing northwestward to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific), which it enters in the southeastern part of T. 9 N., R. 30 W.; length, about 15 miles; fall, 4,700 feet; principal tributary, Davy Brown Canyon Creek. Santa Ynez sheet.

Manzanita Creek; Trinity County; rises in the central part of T. 34 N., R. 12 W., Mount Diablo base and meridian; flows west of south 3 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Maple Creek; Humboldt County; rises in the northwestern part of T. 8 N., R. 2 E., Humboldt base and meridian; flows northwestward into Big Lagoon; length, about 8 miles; principal tributaries, Pitcher Creek and an unnamed stream, about 9 miles long, which enters from the south in the southern part of T. 9 N., R. 1 E. Punnett's map of Humboldt County.

Maple Creek; Humboldt County; rises in the southeastern part of T. 5 N., R. 3 E., Humboldt base and meridian; flows northwestward 4 miles, then southwest and south 3 miles into Mad River (tributary to the Pacific); course circuitous. Punnett's map of Humboldt County.

Marble Canyon Creek; San Bernardino County; T. 3 N., R. 1 E., San Bernardino base and meridian; an intermittent stream, 3 miles long, flowing northward into Mohave Desert. San Gorgonio sheet.

Maria Ygnacio Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 3,000 feet above sea level; flows west of south 7 miles to its junction with Alascadero Creek (which discharges to the Pacific) half a mile south of Goleta; principal tributaries, East Fork and San Antonio creeks. Goleta special map.

Maria Ygnacio Creek, East Fork; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 650 feet above sea level; flows southwestward into Maria Ygnacio Creek (tributary to the Pacific through Alascadero Creek); length, 2 miles; fall, 500 feet. Goleta special map.

Marie Canyon Creek; Los Angeles County; an intermittent stream, 1½ miles long, rising on the southern slope of the Santa Monica Mountains and flowing southward into the Pacific Ocean. Camulos sheet.

Marie Lake; Mono County, Mono National Forest; 1½ miles east of Mount Lyell; outlet, Rush Creek, which discharges to Mono Lake; altitude, 10,750 feet. Mount Lyell sheet.

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Markham Creek; Sonoma County; rises in the northern part of T. 7 N., R. 11 W., Mount Diablo base and meridian; flows west of south 3 miles and joins Russian River just above the point at which the latter enters the Pacific. Punnett's map of Sonoma County.

Markleeville Creek; Alpine County; rises on the east slope of the Sierra near the summit of the divide separating Carson River waters from waters flowing to the Mokelumne; takes a general northeasterly course to its junction with the East Fork of Carson River (tributary through Carson River to Carson Sink); length, about 12 miles; principal tributary, Pleasant Valley Creek. The main stream is locally called Hot Spring Creek above Markleeville, where it is joined by Pleasant Valley Creek. Gaging Station near Markleeville (1911–12) and at Markleeville (1910–1912). Markleeville sheet.

Mark West Creek; Sonoma County; rises on the western slope of the Coast Range in the southeastern part of T. 8 N., R. 7 W., Mount Diablo base and meridian; takes a circuitous but in general westerly course to its junction with Santa Rosa Creek (tributary to Russian River, which flows into the Pacific) near Mount Olivet in San Miguel Rancho; length, including major windings, about 18 miles. Punnett's map of Sonoma County.

Martin Creek; Mendocino County; rises in the northern part of T. 17 N., R. 14 W., Mount Diablo base and meridian; flows southwestward into Big River (tributary to the Pacific); length, 4 miles. Punnett's map of Mendocino County.

Martin Creek; San Mateo County; a short intermittent stream, flowing northeastward into Searsville Lake, which discharges through San Francisquito Creek to San Francisco Bay. Palo Alto and Santa Cruz sheets.

Martinez Canyon Creek; Riverside County; an intermittent stream rising on the southwest slope of Martinez Mountain, at altitude 4,400 feet above sea level, flowing southeastward and eastward to the Colorado Desert; length above mouth of canyon, about 8 miles, in which distance the fall is 3,300 feet. Indio special sheet.

Martis Creek; Placer and Nevada counties; rises in Placer County in the eastern part of T. 16 N., R. 16 E., Mount Diablo base and meridian, at altitude 7,500 feet above sea level; flows northwestward 2 miles, then northeastward 7 miles to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes); length, about 9 miles; fall, 1,800 feet of which 1,200 feet is made in the first 2 miles; many small branching tributaries. Truckee sheet.

Matanzas Creek, Sonoma County. *See* Bennett Creek.

Mathilde Lake; San Mateo County; a small lake in the lower part of San Pedro Valley, a short distance east of the Pacific, from which it is separated by a sand bar. San Mateo sheet.

Matilija Creek; Santa Barbara and Ventura counties; rises in the eastern part of Santa Barbara County, in T. 6 N., R. 24 W., San Bernardino base and meridian, at altitude 5,500 feet above sea level; flows southeastward about 15 miles to the upper end of Ojai Valley, below which it is called Ventura River (tributary to the Pacific); fall in this portion of its course, 4,750 feet; principal tributaries above Ojai Valley, West Fork, Upper North Fork, and North Fork. Mount Pinos and Ventura sheets.

Matilija Creek, North Fork; Ventura County; rises in the northeastern part of T. 5 N., R. 23 W., San Bernardino base and meridian, at altitude 3,700 feet above sea level; flows, in general, southwestward to its junction with Matilija Creek (Ventura River, tributary to the Pacific), half a mile east of Matilija; length, about 5 miles. Mount Pinos and Ventura sheets.

Matilija Creek, Upper North Fork; Ventura County; rises in the southeastern part of T. 6 N., R. 24 W., San Bernardino base and meridian, at alti-

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tude 5,000 feet above sea level; flows southward 4 miles, then southwesterly 3 miles into Matilija Creek (Ventura River, which discharges to the Pacific) near Matilija; length, about 7 miles; fall, 2,800 feet. Mount Pinos and Ventura sheets.

Matilija Creek, West Fork; Ventura County; rises on the north slope of the Santa Ynez Mountains, in the western part of T. 5 N., R. 24 W., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows northeastward to its junction with Matilija Creek (Ventura River, tributary to the Pacific); length, about 3 miles; intermittent. Ventura sheet.

Matthews Creek; Siskiyou County; rises in the southwestern part of T. 39 N., R. 11 W., Mount Diablo base and meridian; flows southwestward and westward to its junction with Salmon River (tributary to Klamath River, which flows to the Pacific); length, 6 miles. Punnett's map of Siskiyou County.

Mattole River; Mendocino and Humboldt counties; rises in Humboldt County, in the northern part of T. 24 N., R. 19 W., Mount Diablo base and meridian; takes a general northwesterly course to the northern part of T. 2 S., R. 2 W., Humboldt base and meridian, where it turns and flows southwestward into the Pacific; length, including major windings, 44 miles; principal tributaries, West Fork, Honeydew Creek, Upper North Fork, Squaw Creek, and North Fork. Gaging station near Petrolia (1911). Punnett's maps of Mendocino and Humboldt counties.

Mattole River, North Fork; Humboldt County; rises in the southwestern part of T. 1 S., R. 1 E.; flows somewhat north of west 8 miles, then south of west and south 4 miles to its junction with Mattole River (tributary to the Pacific) near Petrolia. Many short tributaries draining the southern slopes of Rainbow and Taylors peaks. Punnett's map of Humboldt County.

Mattole River, Upper North Fork; Humboldt County; rises in the southern part of T. 1 S., R. 1 E., Humboldt base and meridian; flows in general southwestward to its junction with Mattole River (tributary to the Pacific) in the northeastern part of T. 3 S., R. 1 W.; length, about 8 miles. Punnett's map of Humboldt County.

Mattole River, West Fork; Humboldt County; rises in the western part of T. 5 S., R. 2 E., Humboldt base and meridian; flows west of north 7 miles, then northeastward 2½ miles into Mattole River (tributary to the Pacific) at Etterburg. Punnett's map of Humboldt County.

Maxy Canyon Creek; Ventura County; an intermittent stream, 4 miles long, rising in the southwestern part of T. 8 N., R. 19 W., San Bernardino base and meridian, and flowing southeastward into Canada de los Alamos Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

May Canyon Creek; Los Angeles County; Los Angeles River basin; an intermittent stream, 3 miles long, draining a portion of the eastern part of T. 3 N., R. 15 W., San Bernardino base and meridian; flows southward toward Pacoima Creek (tributary to Los Angeles River, which discharges to the Pacific) in San Fernando Valley. Fernando sheet.

Means Dry Lake; San Bernardino County; T. 4 N., R. 4 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, p. 73.

Medea Creek; Ventura and Los Angeles counties; an intermittent stream, about 7 miles long, flowing southeastward into Triunfo Creek (tributary to Malibu Creek, which discharges to the Pacific); principal tributaries, Lindero Canyon and Posita Canyon creeks. Camulos sheet.

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Meder Creek; Santa Cruz County; a stream, about 3½ miles long, flowing southward into the Pacific 8 miles west of the Santa Cruz Point. Santa Cruz sheet.

Meeks Creek; Eldorado County; rises in the western part of T. 13 N., R. 17 E. Mount Diablo base and meridian, 1 mile northeast of Phipps Peak, at altitude 8,500 feet above sea level; flows northwestward 3 miles, then northeastward 3 miles into Meeks Bay, Lake Tahoe (outlet, Truckee River to Pyramid and Winnemucca lakes); fall, 2,275 feet; passes through several small lakes. Pyramid Peak and Truckee sheets.

Merced Lake; San Francisco County; lies in a depression separated from the ocean by a narrow ridge. The bottom of Lake Merced is 10 feet below sea level: the drowned valley which the lake occupies undoubtedly once had free access to the ocean at tide level, but sand dunes choked the channel and dammed back the waters until they stood 10 feet above tide. Since then the lake has been artificially raised another 10 feet. San Mateo sheet; Lawson, A. C., Geology of the San Francisco peninsula; Fifteenth Ann. Rept. U. S. Geol. Survey, Part II. 1893–4, pp. 474–75.

Merrill Creek; Siskiyou County; rises in the eastern part of T. 12 N., R. 6 E., Humboldt base and meridian; flows southwestward to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific) half a mile northeast of Somes Bar · length, 4 miles. Punnett's map of Siskiyou County.

Merritt Lake; Alameda County; between Oakland and East Oakland; inlets. Indian Gulch and Hayes creeks; outlet, San Antonio Creek to San Francisco Bay. San Francisco sheet.

Meryl Creek; Klamath County, Oreg.; rises in the eastern part of the county about 6 miles southeast of the south end of Sycan Marsh; flows southward 12 miles into North Fork of Sprague River (tributary through Sprague River to Williamson River and thus through Upper Klamath Lake to Klamath River, which discharges to the Pacific). Klamath sheet.

Mescal Creek; Los Angeles County; rises in the southern part of T. 3 N., R. 8 W., San Bernardino base and meridian; flows northward to the gravels at the edge of Antelope Valley. San Antonio sheet; Land Office map of California, 1907; Water-Supply Paper U. S. Geol. Survey No. 278, 1911, Pl. VI.

Mesquite Dry Lake; San Bernardino County; Tps. 2 and 3 N., R. 8 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Mesquite Dry Lake; San Bernardino County; in T. 19 N., R. 13 E., San Bernardino base and meridian, just west of the Nevada-California State line; Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I. Ivanpah sheet.

Messenger Canyon Creek; Santa Barbara County; an intermittent stream, 6 miles long, rising on the north slope of McPherson Peak and flowing east of north to Cuyama River (Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Methodist Creek; Siskiyou County; rises in the southwestern part of T. 9 N., R. 8 E., Humboldt base and meridian; flows northeastward to its junction with Salmon River (tributary to Klamath River, which flows to the Pacific) near Yocumville; length, 5 miles. Punnett's map of Siskiyou County.

Mettah Creek; Humboldt County; rises in the central part of T. 10 N., R. 2 E., Humboldt base and meridian; flows northeastward into Klamath River (tributary to the Pacific); length, 5 miles. Punnett's map of Humboldt County.

Mexican Canyon Creek; San Diego County; rises in the southern part of T. 16 S., R 1 E., San Bernardino base and meridian, at altitude 1,000 feet above sea level; flows northwestward toward Sweetwater River (tributary to the

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Pacific through San Diego Bay); length, about 3 miles; fall, 600 feet; intermittent. The map (Cuyamaca sheet) gives no indication of a drainage line in this canyon but shows a road leading from Jamacho to North Jamul.

Middle Alkali Lake. *See* Alkali Lakes.

Middle Creek; Klamath River basin; Siskiyou County; rises in the northeastern part of T. 44 N., R. 12 W., Mount Diablo base and meridian, on the eastern slope of Marble Mountains; flows southeastward 5 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Middle Creek; Klamath River basin; Siskiyou County; rises in the northern part of T. 47 N., R. 10 W., Mount Diablo base and meridian; flows in general somewhat west of south to its junction with Horse Creek (tributary to Klamath River, which flows to the Pacific); length, 7 miles. Punnett's map of Siskiyou County.

Middle Slough; Contra Costa County; between Winter and Browns islands. Antioch sheet.

Milk Creek; Klamath County, Oreg.: rises on the western slope of Black Hills; flows southwestward into Sycan River (tributary through Sprague River to Williamson River, and thus through Upper Klamath Lake to Klamath River, which discharges to the Pacific). Klamath sheet.

Milk Ranch Creek; Humboldt County; rises in the western part of T. 5 S., R. 4 E., Humboldt base and meridian; flows southwestward into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Millard Canyon Creek; Los Angeles River basin; Los Angeles County; rises on the southwest slope of Mount Lowe at Crystal Springs, at altitude 4,500 feet above sea level; flows southwestward to Arroyo Seco (tributary to Los Angeles River, which discharges to the Pacific), to which it is tributary, just at the canyon opening, but its waters seldom flow so far as this junction at their low stage. Pasadena sheet; Irrigation in California [southern], Sacramento, 1888, p. 389.

Millard Canyon Creek; Riverside County; T. 2 S., R. 2 E., San Bernardino base and meridian; an intermittent stream rising in the northern part of the township and flowing southward to San Gorgonio Pass, which slopes eastward from a point east of Beaumont to the Colorado desert. The canyon has three forks—the East and Middle uniting near the center of the township and the West coming in a mile below the junction of the other two. San Jacinto sheet.

Millard Canyon Creek; forks of. *See* Millard Canyon Creek.

Mill Creek; Eel River basin; Mendocino County; rises in the southern part of T. 19 N., R. 11 W., Mount Diablo base and meridian; flows west of south about 4 miles, then in general south of west 2½ miles into Eel River (tributary to the Pacific). Punnett's map of Mendocino County.

Mill Creek; Klamath River basin; Humboldt County; rises in the northeastern part of T. 8 N., R. 6 E., Humboldt base and meridian; flows northwestward about 7 miles to the eastern part of T. 9 N., R. 5 E., where it turns abruptly and flows southwestward across the Hoopa Valley Indian Reservation to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, about 15 miles. Punnett's map of Trinity County.

Mill Creek; Klamath River basin; Siskiyou County; rises in the southeastern part of T. 19 N., R. 6 E., Humboldt base and meridian; flows southeastward 2 miles, southward 2 miles, and southwestward 2 miles to its junction with Indian Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

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Mill Creek; Klamath River basin; Siskiyou County; rises in the north-central part of T. 45 N., R. 9 W., Mount Diablo base and meridian; flows south of west 7 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific) at Scott Bar. Punnett's map of Siskiyou County.

Mill Creek; Los Angeles River basin; Los Angeles County; rises 1½ miles northwest of the north line of T. 3 N., R. 11 W., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southwestward to its junction with Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); length, about 6 miles; fall, 1,850 feet; principal tributary, North Fork. Tujunga sheet.

Mill Creek; Mohave River basin; San Bernardino County; rises in the western part of T. 3 N., R. 1 W., San Bernardino base and meridian, at altitude 7,000 feet above sea level; flows southwestward about 8 miles to its junction with Deep Creek (tributary to Mohave River); fall, about 3,000 feet. Deep Creek sheet.

Mill Creek; Mono Lake basin; Mono County; rises in the southeastern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, on the north slope of North Peak, at altitude about 11,300 feet above sea level; flows north of east to the western part of T. 2 N., R. 26 E., where it turns and flows southeast and south into Mono Lake; fall, about 4,900 feet; passes through a number of lakes, of which Lundy Lake is the largest; greater part of course lies through Lundy Canyon, a broad-bottomed trench, which extends with a low grade into the heart of the mountains. On either side walls of granite and metamorphosed slates tower nearly perpendicularly to a height between 2,000 and 3,000 feet. The north wall of the canyon is unbroken, but on the south side is a deep, U-shaped notch where Lake Canyon joins the main gorge. Both Lundy and Lake canyons have low grade, especially near their place of union, but the bottom of the main gorge is 1,000 feet lower than the bottom of its tributary, and the waters of Lake Canyon flow in cascades over solid rock to join the stream below.[1] Bridgeport and Mount Lyell sheets.

Mill Creek; Monterey County; rises in the southeastern part of T. 21 S., R. 4 E., Mount Diablo base and meridian; flows westward into the Pacific 3 miles northwest of Lopez Point; length, about 5 miles. Land Office map of California, 1907, on which it is not named; post route map of California, 1911.

Mill Creek; Russian River basin; Mendocino County; rises in the northeastern part of T. 16 N., R. 14 W., Mount Diablo base and meridian, in Leonard Lake; flows northward 2 miles, then in general south of east 6 miles to its junction with Forsythe Creek through which it is tributary to Russian River (tributary to the Pacific). Punnett's map of Mendocino County.

Mill Creek; Russian River basin; Sonoma County; rises in the northern part of T. 8 N., R. 10 W., Mount Diablo base and meridian; flows eastward 4 miles, then northeastward 2 miles into Dry Creek (tributary to Russian River, which flows into the Pacific). Punnett's map of Sonoma County.

Mill Creek; Santa Ana River basin; San Bernardino County; rises in the eastern part of T. 1 S., R. 1 E., San Bernardino base and meridian, 2 miles southwest of San Gorgonio Mountain; flows westerly to the eastern end of San Bernardino Valley. "Coming out of the mountains about 2 miles south of the point of opening of the Santa Ana, into a broad, very steep sloping side valley, its flood escape way turns to the right and joins the main river bed about 3 miles below its canyon mouth." The branch carrying the name of the stream is indicated on the map as starting at altitude 8,400 feet, but High Creek, its first named tributary, reaches an altitude of 10,500 feet; fall in the 12 miles to

[1] Russell, I. C., Quaternary history of Mono Valley, Cal.: Eighth Ann. Rept. U. S. Geol. Survey, 1889, p. 332.

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the mouth of the canyon, 5,200 feet; principal tributaries, High, Vivian, Falls, and Mountain Home creeks. San Gorgonio and Redlands sheets; Irrigation in California [southern], Sacramento, 1888, p. 120.

Mill Creek; Scott Creek basin; Santa Cruz County; rises on the southern slope of Ben Lomond Mountain, in T. 9 S., R. 3 W., Mount Diablo base and meridian, at altitude 2,000 feet above sea level; flows southwestward 5 miles into Scott Creek (tributary to the Pacific); fall, 1,900 feet. Santa Cruz sheet.

Mill Creek; Smith River basin; Del Norte County; rises in the eastern part of T. 15 N., R. 1 E., Humboldt base and meridian; flows somewhat south of west 3 miles, then in general northward 8 miles to its junction with Smith River (tributary to the Pacific) in the west-central part of T. 16 N., R. 1 E.; principal tributary, East Branch. Punnett's map of Del Norte County.

Mill Creek; Sonoma County. *See* Robert Crane Creek.

Mill Creek; Walker River basin; Mono County; rises in the southwestern part of T. 7 N., R. 23 E., Mount Diablo base and meridian, at altitude 8,500 feet above sea level; flows in general east of north to its junction with Lost Canyon Creek (tributary to West Walker River, and thus through Walker River to Walker Lake); fall, 2,500 feet. Bridgeport sheet.

Mill Creek, East Branch; Del Norte County; rises in the extreme southwestern part of T. 16 N., R. 2 E., Humboldt base and meridian; flows in general westward to its junction with Mill Creek (tributary to Smith River, which flows to the Pacific; length, 5 miles. Punnett's map of Del Norte County.

Mill Creek, North Fork; Los Angeles River basin; Los Angeles County; rises 1½ miles east of Gleason Mountain, at altitude 5,250 feet above sea level; flows southward 2½ miles, then southeastward 2½ miles into Mill Creek (tributary to Tujunga Creek and thus to Los Angeles River, which discharges to the Pacific); fall, 2,250 feet. Tujunga sheet.

Miller Canyon Creek; Santa Barbara County; an intermittent stream, 2 miles long, rising on the north slope of the San Rafael Mountains in Santa Barbara National Forest and flowing east of north into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Miller Creek; Alameda County; rises in the north-central part of T. 2 S., R. 2 W., Mount Diablo base and meridian, at altitude 550 feet above sea level; flows southwestward 1½ miles into San Leandro Creek, which discharges through San Leandro Bay to San Francisco Bay; fall, 250 feet. Concord sheet.

Millers Creek; Paper Mill Creek basin; Marin County; rises near the southern border of Rancho de Nicasio; flows northwestward 3 miles into Nicasio Creek (tributary to Paper Mill Creek, which flows to the Pacific through Tomales Bay) near Nicasio. Punnett's map of Marin County.

Millers Creek; Rhett Lake basin; Klamath County, Oreg.; rises in the southeastern part of the county; flows westward and southwestward to Langells Valley, where it unites with Lost River (tributary to Rhett Lake); upper course of this creek lies through Horse Fly Valley. Klamath sheet; see also annual reports of United States Reclamation Service.

Milliken Creek; Napa County; rises in the southeastern part of T. 7 N., R. 4 W., Mount Diablo base and meridian, at altitude 1,900 feet above sea level; takes a general southerly course to its junction with Soda Creek (tributary to Napa River, which discharges to San Pablo Bay); length, about 10 miles; fall, 900 feet. Napa sheet.

Mindego Creek; San Gregorio Creek basin; San Mateo County; rises in the west-central part of T. 7 S., R. 3 W., at altitude 2,000 feet above sea level; flows north of west 2 miles, then west of south 2 miles to join Alpine Creek to form San Gregorio Creek, which discharges to the Pacific; fall, about 1,500 feet. Santa Cruz sheet.

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Mine Canyon Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising in the Santa Barbara National Forest, southeast of McPherson Peak, and flowing southwestward into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Mine Canyon Creek; San Luis Obispo County; an intermittent stream, about 4 miles long, draining a small area in the San Luis Range and flowing southeastward to Harford Canyon, which discharges to San Louis Obispo Creek (tributary to the Pacific). Port Harford sheet.

Mine Gulch Creek; Los Angeles County; rises on the east slope of North Baldy, at altitude 7,750 feet above sea level; flows southeastward 2 miles into Prairie Fork of San Gabriel River (tributary to San Gabriel River, which flows to the Pacific); fall, 3,250 feet. Rock Creek and San Antonio sheets.

Miners Creek; Siskiyou County; rises in the northwestern part of T. 40 N., R. 9 W., Mount Diablo base and meridian, on the Mount of the Cross; flows northeastward 3 miles, then northward 2 miles to join French Creek (tributary to Scott River and thus through Klamath River to the Pacific). Punnett's map of Siskiyou County.

Minnehaha Creek; Trinity County; rises in the eastern part of T. 38 N., R. 8 W., Mount Diablo base and meridian; flows east and southeast into Trinity River (tributary to Klamath River, which flows to the Pacific); length, 3 miles. Punnett's map of Trinity County.

Minor Creek; Humboldt County; rises in the southwestern part of T. 7 N., R. 4 E., Humboldt base and meridian; flows northwestward 2 miles, then westward 2½ miles into Redwood Creek (tributary to the Pacific) near Bairds. Punnett's map of Humboldt County.

Mint Canyon Creek; Los Angeles County; rises in the west-central part of T. 5 N., R. 14 W., San Bernardino base and meridian, at altitude 2,400 feet above sea level; flows southwestward to Santa Clara River (tributary to the Pacific) to which it delivers water only in times of flood; fall in the 1½ miles at the head, 500 feet; in the lower 7 miles of its course the channel is a sandy wash. Fernando sheet.

Mirror Lake; Ventura River basin; Ventura County; near Ojai Station; intermittent. Ventura sheet.

Mission Canyon Creek; Santa Barbara County; an intermittent stream rising in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 3,250 feet above sea level, and flowing southward to Santa Barbara Mission, then irregularly southeastward through the City of Santa Barbara to a small marsh through which it discharges to the Pacific; length, about 8 miles; tributary, Rattlesnake Canyon Creek. Santa Barbara special sheet.

Mission Creek; Colorado desert; San Bernardino and Riverside counties; formed in the central part of T. 1 S., R. 3 E., San Bernardino base and meridian, by the union of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the southern part of T. 1 N., R. 2 E., at altitude 8,000 feet above sea level; flows eastward and southeastward 6 miles to the point at which it receives the South Fork; below the forks the general course of the creeks is southeastward to Colorado desert; intermittent; fall in the 13 miles from the head of the North Fork to Hog Ranch, 5,500 feet. San Gorgonio and San Jacinto sheets.

Mission Creek; Coyote River basin; Alameda County; an intermittent stream, about 5 miles long, rising 1 mile north of Mission Peak, at altitude 1,350 feet above sea level, and flowing in general northwestward to The Lagoon north of Irvington. Overflow from The Lagoon passes southward through Arroyo de la

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Laguna to the tidal marsh north of Coyote River (tributary to San Francisco Bay). Pleasanton sheet.

Mission Creek, forks of. *See* Mission Creek.

Mission Creek; Salinas River basin; Monterey County; rises in the northern part of T. 21 S., R. 6 E., Mount Diablo base and meridian; flows east of south into San Antonio River (tributary to Salinas River, which enters the Pacific in Monterey Bay) at San Antonio Mission; length, about 8 miles. Land Office map of California, 1907.

Mitchell Creek; Mendocino County; rises in the southern part of T. 18 N., R. 17 W., Mount Diablo base and meridian; flows irregularly westward; enters the Pacific 1 mile south of Beaver Point; length, about 3 miles. Punnett's map of Mendocino County.

Mitchell Creek; Seal Creek basin; Contra Costa County; rises in the southeastern part of T. 1 N., R. 1 W., Mount Diablo base and meridian, 2 miles northwest of Mount Diablo, at altitude about 1,000 feet above sea level; flows northerly to Mount Diablo Creek (tributary through Seal Creek to Suisun Bay); length, about 3½ miles; fall, about 550 feet. Mount Diablo sheet.

Moat Lake; Mono County; northeastern part of T. 2 N., R. 24 E., Mount Diablo base and meridian; outlet, a stream half a mile long, flowing southeastward to one of the Virginia lakes (outlet Virginia Creek to East Walker River and thus through Walker River to Walker Lake); altitude, about 10,550 feet; fall of outlet, about 700 feet. Brideport sheet.

Modelo Canyon Creek; Ventura County; an intermittent stream, 2 miles long, flowing southeastward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) 1 mile northeast of Piru. Camulos sheet.

Moffitt Creek; Siskiyou County; rises in the eastern part of T. 42 N., R. 8 W., Mount Diablo base and meridian, on the west slope of Moffitt Creek Mountains; winds irregularly northward about 14 miles, then bends to the northwest, west, and southwest to its junction with Scott River (tributary through Klamath River to the Pacific) near Fort Jones, in the northeastern part of T. 43 N., R. 9 W.; length, including major windings, 22 miles; principal tributary, Cherry Creek. The map (Punnett's map of Siskiyou County) does not clearly indicate whether the name Moffitt or Cherry should be applied to the stretch of stream below the junction of the two creeks. Moffitt is here considered the main stream because its drainage basin is so much the larger of the two. Punnett's map of Siskiyou County.

Mohave River; rises in San Bernardino County on the north slope of the Sierra Madre, its headwaters flowing from elevations of 5,000 to 8,000 feet above sea level; takes a circuitous course, winding successively to the west, north, and east, decreasing in volume as it passes onto the plains, and finally disappears in its sandy bed a short distance below Barstow at an elevation of 1,900 feet above sea level. As measured by planimeter on the San Bernardino County map, the drainage basin comprises 1,470 square miles, of which 251 square miles may be classed as mountains, 219 square miles as foothills, and 1,000 square miles as plains and desert buttes.[1]

Most of the mountains to the west of the basin drain toward Mohave Desert, but the streams are few and small and the water disappears as soon as it reaches the hot sands. The general slope of the valley from the west is toward Mohave River at the rate of 2 feet to the mile, but the rainfall is so light—about 3 inches a year—and the summer heat is so great, that the run-off is not visible on the surface. In the mountains of the basin heavy rains are frequent, and, falling on slopes that are both rugged and steep, cause floods which pour

[1] Nineteenth Ann. Rept. U. S. Geol. Survey, pt. 4, 1898, pp. 614–616.

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out of the hills far beyond the limit of the surface, flow into the desert, fill the porous sand and gravel of the river bed, and then disappear as rapidly as they came. South of Victorville, at a point known as the Narrows, the river has cut through a low range of hills. The gorge is narrow and its bounding walls are abrupt, granite cliffs; principal tributaries, West Fork and Deep Creek. Gaging station at Victorville (1899–1906). The sink of the Mohave is called Soda Sink.

Authorities: San Antonio, Hesperia, Deep Creek, and Redlands sheets; Land Office map of California, 1907; Water-Supply Paper U. S. Geol. Survey No. 300. 1912, pp. 25–26. *See* also Water-Supply Paper No. 224, pp. 10, 14–15.

Mohave River, West Fork; San Bernardino County; rises in the central part of T. 2 N., R. 5 W., San Bernardino base and meridian; at altitude 5,000 feet above sea level; flows in general northeastward to its junction with the main channel at the mouth of Deep Creek; the principal tributaries of the West Fork are its East Fork, and Grass Valley Creek. Hesperia and Deep Creek sheets.

Mohave River, West Fork, East Fork of; San Bernardino County; rises in the western part of T. 2 N., R. 3 W., San Bernardino base and meridian, at altitude 5,250 feet above sea level; flows north of west about 6 miles to its junction with the West Fork of Mohave; fall, 2,000 feet. Hesperia and Deep Creek sheets.

Molino Creek; Santa Cruz County; in the western part of San Vicente Rancho, at altitude 1,100 feet above sea level; flows southwestward 3 miles, then northwestward half a mile into Scott Creek (which discharges to the Pacific) near its mouth; intermittent. Santa Cruz sheet.

Mono Creek; Santa Ynez River basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the San Rafael Mountains 2 miles northeast of Strawberry Peak, at altitude 4,500 feet above sea level; flows southeastward 6 miles, then to the south and southwest 15 miles to its junction with Santa Ynez River (tributary to the Pacific); drainage area comprises 120 square miles on the south slope of the San Rafael Mountains; principal tributaries, Roble Canyon and Indian creeks. Gaging station at Mono dam site (1902–1904). Santa Ynez sheet.

Mono Lake; Mono County; within a few miles of the California-Nevada boundary; the 38th parallel and the 119th meridian intersect in the center of the lake; the western rim of the drainage area, formed by the crest line of the Sierra, coincides for 36 miles with the western margin of the Great Basin; the lowest pass in the serrate mountain crest along its western border is 3,000 feet above its surface; the highest peaks that overshadow it rise more than 6,000 feet above the level of the lake; the eastern part of the basin partakes of the character of the arid region of the interior basins, and includes valleys covered with sage brush, and rugged mountain slopes which are but scantily clothed with cedar and piñon. Over this portion no running water can be found during the greater part of the year, but, that it is not really a desert is shown by the fact that among the clumps of sage brush it produces nutritious bunch grass in sufficient abundance to afford pasturage for a few cattle and horses. The southwestern border of the basin includes magnificent mountains that support, in favored places, forests of pine. The highest peaks reach far above the timber line and bear a varied and beautiful alpine flora.

In outline the lake is rudely circular; its north-south axis measures 10 miles, and its east-west axis, 14 miles; including islands, its area is about 87 square miles.

The deepest part of the lake is near the southern border of the terrace surrounding Paoha Island, where sounding gave 152 feet of water; the average depth is about 61 feet.

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The entire bottom is of soft black mud, except to the south of the larger islands, where a tenacious blue clay is found over a considerable area. About the shore a narrow band of volcanic sand and gravel, derived from the Mono Craters and from Black Point, records the transporting power of waves and currents.

The lake derives its principal water supply from the creeks that descend the eastern slope of the Sierra and empty into it from the south and west; supplementing the surface drainage are a number of springs, some of which are of considerable size.

The creeks tributary to Lake Mono are of clear water and flow through channels excavated for the most part in granite and metamorphosed sediment, but near their mouths they have eroded small gorges through materials deposited during previous high-water stages of the lake. Most of the springs of the basin are either in the bottom of the lake or near its shores, and they are most numerous near the base of the mountains that lie close to the western shore. None of the springs are highly charged with mineral matter and some of the more copious are remarkable for their purity.

Only three of the springs that rise on the land surface have a temperature noticeably above the normal. The character of those rising in the bottom of the lake is uncertain; some of them reveal their presence in cold weather by a vapor on the lake surface above them, and are thus known to be thermal. At the western end of the lake are a number of springs, some of which rise from the bottom of the lake. The positions of the springs rising in the lake near Black Point are indicated in calm weather by the eddies they produce on the lake surface; on rowing over these submerged springs it is found that some of them rise from the tops of tufa crags, which are covered by 10 or 12 feet of water. The upward rush of fresh water from the orifices of the summits of these towers through the denser waters of the lake is in places sufficiently strong to deflect a boat allowed to float over them. Other tufa domes rise above the surface of the lake near the shore; many of them are vase-shaped and the tops of several are hollowed so as to form basins. A few of these depressions are filled with clear, fresh water that rises through the porous and tubular tufa of which the submerged shaft is composed. The water of one of these natural fountains, rising in a lake whose water is utterly undrinkable, is of exceptional purity. These springs fill a bowl 3 or 4 feet in diameter in the top of a tufa dome that rises about 3 feet above the lake surface and overflow, fountainlike, into the surrounding alkaline waters.

Like all inclosed water bodies Mono Lake is subject to changes of level dependent on alternations of season and on secular climatic oscillations. In the summer of 1883 Russell determined the altitude of the surface as 6,380 feet above sea level; in 1898–99, when the Mount Lyell quadrangle was surveyed, the altitude was determined as 6,412 feet; in October, 1909, the water surface was 6,426 feet above sea level.

The lake is destitute of molluscan or fish life; it is inhabited only by a crustacean peculiar to alkaline and saline waters and by insects and their larvæ. The principal streams flowing into Lake Mono are Mill, Leevining, and Rush creeks.

Authorities.—Quaternary history of Mono Valley, Cal., by I. C. Russell (Eighth Ann. Rept. U. S. Geol. Survey, pt. 1, 1889, pp. 269–270, 287–291, 298, 319[1]; Bridgeport, Hawthorne, and Mount Lyell sheets.

Monroe Canyon Creek; San Gabriel River basin; Los Angeles County; an intermittent stream, about 2 miles long, rising in the northern part of T. 1 N., R. 9 E., San Bernardino base and meridian, and flowing southward into Big

[1] Copies of this report are still available for distribution.

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Dalton Canyon (tributary to San Gabriel River, which discharges to the Pacific). Pomona sheet.

Monroe Canyon Creek; Santa Ana River basin; San Bernardino County; rises in eastern part of T. 1 N., R. 2 W., San Bernardino base and meridian, at altitude 4,300 feet above sea level; flows southwestward into Keller Creek (tributary to Santa Ana River, which discharges to the Pacific); length, 2 miles; fall, 1,500 feet. Redlands sheet.

Montezuma Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends from Chain Island, at the mouths of Sacramento and San Joaquin rivers, northwestward to the base of the Potrero Hills and then southwestward into the bay north of the mouth of Suisun Creek. Antioch and Napa sheets.

Monument Gulch Creek; Siskiyou County; rises in the western part of T. 46 N., R. 9 W., Mount Diablo base and meridian; flows northwestward 2 miles into Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

Mooney Gulch Creek; Trinity County; rises in the southwestern part of T. 34 N., R. 7 W., Mount Diablo base and meridian; flows westward 5 miles to its junction with Trinity River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Trinity County.

Moorehouse Creek; Siskiyou County; rises in the southwestern part of T. 41 N., R. 12 W., Mount Diablo base and meridian; flows southwestward to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific) near McNeals; length, 10 miles. Punnett's map of Siskiyou County.

Moosa Canyon Creek; San Diego County; rises in the eastern part of T. 11 S., R. 2 W., San Bernardino base and meridian, on the east slope of Burnt Mountain, at altitude 1,600 feet above sea level; flows northwestward to its junction with San Luis Rey River (tributary to the Pacific Ocean) near Bonsall; length, 12 miles; fall, 1,450 feet; intermittent; principal tributary, South Fork. San Luis Rey sheet.

Moosa Canyon Creek, South Fork; San Diego County; rises in the western part of T. 11 S., R. 2 W., San Bernardino base and meridian, at altitude 1,350 feet above sea level; flows westward 2 miles and northwestward 2½ miles into Moosa Canyon Creek, through which it is tributary to San Luis Rey River, which discharges to the Pacific Ocean; fall, 950 feet; intermittent. San Luis Rey sheet.

Morales Canyon Creek; San Luis Obispo County; an intermittent stream rising in the southern part of T. 32 S., R. 20 E., Mount Diablo base and meridian, and flowing southward toward Cuyama River (Santa Maria River, which discharges to the Pacific) in the southeastern part of T. 11 N., R. 28 W., San Bernardino base and meridian. McKittrick sheet.

Morano Creek; San Luis Obispo County; rises in the northwestern part of T. 29 S., R. 14 E., Mount Diablo base and meridian; flows westward into Salinas River (tributary to the Pacific in Monterey Bay) east of Santa Margarita. Land Office map of California, 1907.

Morey Canyon Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising in the Santa Barbara National Forest, and flowing southwestward into Santa Agueda Creek, which discharges to Santa Ynez River (tributary to the Pacific). Santa Ynez and Lompoc sheets.

Morgan Canyon; Ventura County; a drainage way extending northwestward from the north slope of South Mountain toward Santa Clara River (tributary to the Pacific) in T. 3 N., R. 21 W., San Bernardino base and meridian. Santa Paula sheet.

Morgan Creek; Inyo County; Inyo National Forest; rises on the eastern slope of Mount Morgan, at altitude 12,800 feet above sea level; flows southwestward 3 miles, then southeastward 2 miles into Pine Creek (tributary through

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Rock Creek to Owens River, which discharges to Owens Lake); fall, 5,300 feet. Mount Goddard sheet.

Morongo Creek, Big; San Bernardino and Riverside counties; rises in the south-central part of T. 1 N., R. 3 E., San Bernardino base and meridian, at altitude 7,500 feet above sea level; flows southeastward 8 miles to the northern edge of Morongo Valley, where its waters sink; they reappear at the southern edge of the valley and flow southward in a canyon to the Colorado Desert where, in times of flood, they unite with Mission Creek; the altitude at the mouth of the lower canyon is about 1,700 feet above sea level. San Gorgonio sheet.

Morongo Creek, Dry; San Bernardino County; eastern part of T. 1 S., R. 3 E.; an intermittent stream, 6 to 8 miles long, flowing southeastward toward Mission Creek Wash, in the Colorado Desert. San Gorgonio sheet.

Morongo Creek, Little; San Bernardino and Riverside counties; rises in the west-central part of T. 1 N., R. 3 E., San Bernardino base and meridian, at altitude 8,000 feet above sea level; flows southeastward about 12 miles to the northeastern end of Morongo Valley; sinks in passing the valley and reappears again in a canyon to the south and continues in its southerly course to the Colorado Desert, where its wash joins that of Mission Creek; altitude at the mouth of the canyon, 1,500 feet; total length, about 20 miles. San Gorgonio sheet.

Morrill Canyon Creek; Riverside County; an intermittent stream, about 2½ miles long, rising on the western slope of the Elsinore Mountains in T. 6 S., R. 5 W., San Bernardino base and meridian, and flowing southwesterly into San Juan Canyon Creek. Elsinore sheet.

Morrison Creek; Mendocino County; rises on the west slope of the Coast Range in the central part of T. 14 N., R. 11 W., Mount Diablo base and meridian; flows in general northwestward 6 miles, then southwestward 1 mile into Russian River (tributary to the Pacific). Punnett's map of Mendocino County.

Morro Creek; San Luis Obispo County; rises in the Santa Lucia Mountains in the southern part of Asuncion Rancho, at altitude 1,400 feet above sea level; flows westward 1½ miles, southward 2 miles, then southwestward about 8 miles to the north side of the channel leading from Morro to Estero Bay on the Pacific Ocean; principal tributary, East Fork. San Luis Obispo and Cayucos sheets.

Morro Creek, East Fork; San Luis Obispo County; an intermittent stream, 1½ miles long, rising in the Santa Lucia Mountains in T. 29 S., R. 12 E., Mount Diablo base and meridian, and flowing westward into Morro Creek, which discharges to the Pacific. San Luis Obispo sheet.

Morse Canyon Creek; San Bernardino County; an intermittent stream, about 2 miles long, rising in the northern part of T. 1 N., R. 6 W., San Bernardino base and meridian, and flowing southward toward Santa Ana River (tributary to the Pacific) into San Bernardino Valley. Cucamonga sheet.

Morton Canyon Creek; San Bernardino County; rises in the northern part of T. 1 S., R. 2 W., San Bernardino base and meridian, on the southwest slope of Morton Peak, at altitude 4,250 feet; flows northwestward 1½ miles, southwestward 1½ miles, then again northwestward 1½ miles into Santa Ana River (tributary to the Pacific); fall, 2,400 feet; intermittent. Redlands sheet.

Mountain Home Creek; San Bernardino County; rises in the central part of T. 1 N., R. 1 W., San Bernardino base and meridian, at altitude 7,500 feet above sea level; flows westward 2 miles through Martin Glen, then southward 3 miles into Mill Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 3,950 feet; principal tributary, East Fork. San Gorgonio sheet.

Mountain Home Creek, East Fork; San Bernardino County; rises in the southwestern part of T. 1 N., R. 1 E., San Bernardino base and meridian, at

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altitude 10,000 feet above sea level; flows northwestward 2 miles, then southwestward 2 miles into Mountain Home Creek (tributary through Mill Creek to Santa Ana River, which discharges to the Pacific); fall, 5,700 feet. San Gorgonio sheet.

Mountain Lake; San Francisco County; a small lake near the U. S. Marine Hospital, San Francisco City. San Francisco sheet.

Mountaineer Creek; Alpine County; rises on the east slope of Leviathan Peak, at altitude 7,800 feet above sea level; flows east of north 2 miles, then northwestward 3 miles, and unites with Leviathan Creek to form Bryant Creek (tributary through East Fork of Carson River to Carson River, which discharges to Carson Sink); fall, about 1,600 feet. Markleeville sheet.

Mount Diablo Creek; Contra Costa County; rises in the western part of T. 1 N., R. 1 E., Mount Diablo base and meridian, at altitude 900 feet above sea level; flows northwestward into Seal Creek, which discharges to the tidal marsh south of Suisun Bay; principal tributaries, Peacock and Mitchell creeks. Mount Diablo sheet.

Mount Eden Creek; Alameda County; a sloughlike stream draining a small area about 3 miles northwest of Union City Salt Works and discharging into San Francisco Bay 1½ miles north of Alameda Creek. Haywards sheet.

Mowry Slough; Alameda County; in the tidal marsh at the southern end of San Francisco Bay, north of mouth of Coyote River. Palo Alto sheet.

Mud Creek; Ventura County; rises in the eastern part of T. 4 N., R. 21 W., San Bernardino base and meridian, on the south slope of Santa Paula ridge, at altitude 2,250 feet above sea level; flows southwestward 2½ miles into Santa Paula Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 1,500 feet. Santa Paula sheet.

Mud Slough; Alameda County; in the tidal marsh at the southern end of San Francisco Bay, extending northeastward from Coyote River. San Jose sheet.

Mud Slough; Solano County; in the tidal marsh on the north side of Suisun Bay, between Wheeler and Dutton and Simmons islands. Antioch sheet.

Mule Creek; Trinity County; rises in the eastern part of T. 35 N., R. 9 W., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southeastward to its junction with Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 8 miles; fall, 3,500 feet. Red Bluff sheet.

Murietta Creek; Riverside County; rises on the northern slope of the Santa Rosa Mountains, 6 miles south of Lake Elsinore, at altitude about 2,200 feet above sea level; flows northwestward 1 mile, north of east 3 miles, then southeastward along the foot of the Santa Rosa Mountains to the head of Temecula Canyon, where it unites with Temecula River (Santa Margarita River, which discharges to the Pacific); length of this fork of the Santa Margarita, about 15 miles; intermittent. Elsinore and San Luis Rey sheets.

Murphy Canyon Creek; San Diego County; rises in northern part of Ex Mission San Diego Rancho, at altitude 800 feet above sea level; flows southwestward 4 miles, then southward 4 miles into San Diego River, which discharges to the Pacific through False Bay; intermittent; fall, 750 feet; principal tributary, Shepherd Canyon Creek. La Jolla sheet.

Murphy Creek; Mono County; rises in the northeastern part of T. 6 N., R. 24 E., Mount Diablo base and meridian, at altitude 10,600 feet above sea level; flows southeastward 4 miles and eastward 2 miles into East Walker River (tributary to Walker River, which discharges to Walker Lake); fall, 4,300 feet. Bridgeport sheet.

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Murray Canyon Creek; Riverside County; rises in the eastern part of T. 5 S., R. 3 E., San Bernardino base and meridian, on the east slope of the San Jacinto Mountains, at altitude 8,000 feet above sea level; flows southeastward and eastward about 7 miles; sinks before reaching Palm Canyon Creek, which discharges to the Colorado Desert. San Jacinto sheet.

Murray Canyon Creek; San Diego County; rises in the western part of Ex Mission San Diego Rancho, at altitude 400 feet above sea level; flows southwestward above 3 miles; sinks before reaching San Diego River, which discharges to the Pacific through False Bay; fall, 350 feet. La Jolla sheet.

Mustang Canyon Creek; Santa Barbara County; an intermittent stream, 3 miles long, rising in the western part of T. 11 N., R. 29 W., San Bernardino base and meridian, and flowing east of north to Cuyama River (Santa Maria River, which discharges to the Pacific). McKittrick sheet.

Mutau Creek; Ventura County; rises in the central part of T. 6 N., R. 21 W., San Bernardino base and meridian, at altitude 5,500 feet above sea level; flows southeastward 2 miles, then northeastward 6 miles into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 1,100 feet; principal tributaries, Little Mutau and Alamo creeks. Mount Pinos sheet.

Mutau Creek, Little; Ventura County; rises in the northeastern part of T. 6 N., R. 20 W., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows northwestward into Mutau Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific); length, 4 miles; fall, 1,800 feet. Tejon and Mount Pinos sheets.

Myrtle Creek; Del Norte County; rises in the north-central part of T. 17 N., R. 1 E., Humboldt base and meridian; flows southward about 6 miles to its junction with Smith River (tributary to the Pacific) opposite and just above the mouth of the South Fork. Punnett's map of Del Norte County.

Mystic Lake; Riverside County; San Jacinto Valley; receives the flood waters of San Jacinto River (q. v.). Elsinore sheet.

Nacimiento Creek; Monterey and San Luis Obispo counties; rises in the Monterey National Forest, in the northern part of T. 22 S., R. 5 E., Mount Diablo base and meridian; flows southeastward about 27 miles, in a course parallel to but directly opposite that of the Salinas River, then eastward and northeastward about 18 miles to the southeastern part of T. 24 N., R. 11 E., where it joins Salinas River (tributary to the Pacific in Monterey Bay); principal tributaries, North Fork and Franklin creeks. Gaging station near Bryson (1901). Land Office map of California, 1907, on which it is called Sierra River.

Nacimiento Creek, North Fork; Salinas River basin; Monterey County; rises in the eastern part of T. 22 S., R. 4 E., Mount Diablo base and meridian; flows southeastward to its junction with Sierra River [Nacimiento Creek] (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 12 miles. Land Office map of California, 1907.

Napa River; Napa County; rises in the northern part of T. 9 N., R. 7 W., Mount Diablo base and meridian; flows southeastward and enters San Pablo Bay through Mare Island Strait and Carquinez Strait; in the lower 8 miles flows through a tidal marsh in which it is connected by sloughs with Sonoma Creek; principal tributaries, Conn, Soda, Dry, Napa, Tulucay, Suscol, and Carneros creeks. Napa sheet; Punnett's map of Napa County.

Napa Sloughs; Sonoma County; in the tidal marshes between Sonoma Creek and Napa River; the largest of the sloughs extends southwestward from Napa River to the mouth of Sonoma Creek. Two miles north of Napa Slough is Second Napa Slough, extending eastward and northeastward from Sonoma Creek to Hudeman Slough. Third Napa Slough extends eastward from Steamboat Slough to Second Napa Slough and Hudeman sloughs. Napa sheet.

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Natchett Creek. *See* Hatchet Creek.

Natividad Creek; Monterey County; an intermittent stream flowing southwestward into the marshy area in the Salinas Valley (drained by Salinas River, which discharges to the Pacific) northeast of the city of Salinas. Salinas Valley map, sheet 1.

Navarro River; Mendocino County; formed in the western part of T. 14 N., R. 14 W., Mount Diablo base and meridian, by the junction of Rancheria, Anderson, and Indian creeks. Rancheria Creek, which drains the larger area and should therefore be considered the continuation of the main stream, rises in the northern part of T. 11 N., R. 12 W., and takes a general northwesterly course to the southeastern part of T. 14 N., R. 15 W., then turns abruptly and flows eastward and northward to its junction with Anderson and Indian creeks. Below these forks Navarro River flows northwestward to the point at which it enters the Pacific, between Navarro Head and Saddle Point; total length of the river from the head of Rancheria Creek to Navarro Head, including major windings, 50 miles; principal tributary below the forks, North Fork. Punnett's map of Mendocino County.

Navarro River, North Fork; Mendocino County; rises in the western part of T. 15 N., R. 13 W., Mount Diablo base and meridian; flows somewhat north of west, and unites with Navarro River (tributary to the Pacific) near the center of T. 15 N., R. 16 W.; length, including major windings, 20 miles; principal tributary, North Fork of North Fork Navarro. Punnett's map of Mendocino County.

Navarro River, North Fork of North Fork; Mendocino County; rises in the northwestern part of T. 15 N., R. 14 W., Mount Diablo base and meridian, flows north of west 6 miles, then south of west 3 miles to its junction with the North Fork of Navarro River (tributary through Navarro River to the Pacific) near North Fork station. Punnett's map of Mendocino County.

Negro Butte Dry Lake; San Bernardino County; T. 4 N., R. 2 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Nelson Creek; Monterey County; rises in the western part of T. 22 S., R. 14 E., Mount Diablo base and meridian; flows westward and southwestward into Indian Valley Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 12 miles. Land Office map of California, 1907.

Newark Creek; Alameda County; a channel in the tidal marsh at the southern end of San Francisco Bay, extending from a point near Jarvis Landing to Plummer Creek. Haywards sheet.

Newell Creek; Santa Cruz County; rises in the northeastern part of T. 9 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows west of south to its junction with San Lorenzo River (tributary to the Pacific) near Ben Lomond; length, about 6 miles; fall, 900 feet. Santa Cruz sheet.

Newhall Creek; Los Angeles County; rises north of Fernando Pass; flows northwestward about 4 miles into Placerita Creek (tributary to Santa Clara River, which discharges to the Pacific); intermittent. Santa Susana sheet.

New River; Klamath River basin; Trinity County; rises in the eastern part of T. 9 N., R. 7 E., Humboldt base and meridian; takes a general southwesterly course to the southeastern part of T. 6 N., R. 6 E., where it enters Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 22 miles; principal tributaries, Slide, Virgin, East Fork of New, Devils Canyon, Emigrant Gulch, Big, and Bell creeks. Punnett's map of Trinity County.

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New River; Salton Sink basin; Riverside County; a drainage channel passing northward through Imperial Valley to Salton Sea; carries excess and waste water for the irrigation system and for the power plant. The river was created in the summer of 1905 when the Colorado, overflowing its banks, flooded several hundred square miles about Calexico in the Imperial Valley, deepened and widened Alamo River, which had been one of the Colorado distributaries during the formation of its delta, and developed another drainage channel to the west through Imperial Valley in a second gorge. Gaging station near Brawley (1908–1910). Land Office map of California, 1907; Water-Supply Paper U. S. Geol. Survey No. 251, 1910, p. 42. See also Water-Supply Paper U. S. Geol. Survey No. 225.

New River, East Fork; Trinity County; rises in the southern part of T. 37 N., R. 12 W., Mount Diablo base and meridian; flows southwestward 2 miles, southward 1½ miles, then south of west 4 miles into New River (tributary through Trinity River to Klamath River, which discharges to the Pacific); principal tributary, Pony Creek. Punnett's map of Trinity County.

Newsom Canyon Creek; Arroyo Grande Creek basin; San Luis Obispo County; an intermittent stream draining a small area in the southeastern part of Santa Manuela Rancho and flowing westward to Arroyo Grande Valley. Arroyo Grande sheet.

New York Slough; Contra Costa County; north of Los Medanos and south of Browns Island. Antioch sheet.

Nicasio Creek; Marin County; rises near the eastern border of Rancho Nicasio; takes a general westerly course to its junction with Paper Mill Creek (tributary to Tomales Bay) near Garcia; length, about 10 miles; principal tributary, Millers Creek. Punnett's map of Sonoma and Marin counties.

Nicholas Canyon Creek; Los Angeles County; rises in the western part of T. 1 S., R. 19 W., San Bernardino base and meridian; flows west of south 2½ miles into the Pacific Ocean. Camulos sheet.

Nichols Canyon Creek; Los Angeles County; an intermittent stream, 1½ miles long, draining a small area in the eastern part of the Santa Monica Mountains and discharging southward into Ballona Creek, in La Brea Rancho. Santa Monica sheet.

Nigger Canyon Creek; San Luis Rey River basin; San Diego County; northeastern part of T. 10 S., R. 1 W., San Bernardino base and meridian; extends southwestward about 1½ miles toward San Luis Rey River (tributary to the Pacific); lies south of Pauma Creek; intermittent. Ramona sheet.

Nigger Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 1 mile long, flowing southward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) at Piru. Camulos sheet.

Nigger Slough; Los Angeles County; occupies a completely enclosed depression about 5 miles north of Wilmington; this slough is nearly 4 miles long and more than 1 mile in maximum width. Redondo sheet.

Niggerville Gulch Creek; Siskiyou County; rises in the central part of T. 39 N., R. 12 W., Mount Diablo base and meridian; flows southwestward into Salmon River (tributary to Klamath River, which discharges to the Pacific); length, 3 miles. Punnett's map of Siskiyou County.

Nip and Tuck Creek; Mendocino County; rises in the northwestern part of T. 11 N., R. 15 W., Mount Diablo base and meridian; flows south of west, and enters the Pacific one-fourth mile south of the mouth of Hardscrabble Creek; length, 2 miles. Punnett's map of Mendocino County.

Noble Creek; Riverside County; Santa Ana River basin; rises in the southwestern part of T. 1 S., R. 1 E., San Bernardino base and meridian, at altitude 8,500 feet above sea level; flows southwestward 10 miles into Little San Gor-

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gonio Creek (tributary through San Timoteo Creek to Santa Ana River, which discharges to the Pacific); fall, 6,100 feet. San Gorgonio and San Jacinto sheets.

Nojoqui Creek; Santa Barbara County; an intermittent stream, rising in the Santa Barbara National Forest on the north slope of Santa Ynez Mountains, and flowing west and north into Santa Ynez River (tributary to the Pacific); length, about 7 miles. Lompoc sheet.

Nolan Creek; Sonoma County; rises in the northern part of Rancho Estero Americano; flows southward 3 miles to Salmon Creek (tributary to the Pacific). Punnett's map of Sonoma County.

Nordheumer Creek; Siskiyou County; rises in the eastern part of T. 10 N., R. 6 E., Humboldt base and meridian, on the eastern slope of Orleans Mountains; flows northward 2½ miles, then eastward 4 miles to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

North Lake; Inyo County; Inyo National Forest; southwestern part of T. 8 S., R. 31 E., Mount Diablo base and meridian; inlet and outlet, North Fork of Bishop Creek, which flows through the lake to its junction with Middle Fork (tributary through Bishop Creek to Owens River, which discharges to Owens Lake); altitude, 9,350 feet above sea level; dammed at outlet. Mount Goddard sheet.

Noyce Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends northward from the bay into Simmons Island. Antioch sheet.

Noyo River; Mendocino County; formed in the eastern part of T. 18 N., R. 17 W., Mount Diablo base and meridian, by the union of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, is formed by the union of Hayworth Creek with the Upper South Fork of the Noyo, the Upper South Fork being considered the continuation of the North Fork. The Upper South Fork rises in the southern part of T. 19 N., R. 14 W., and flows in general southwestward to the point at which it is joined by Hayworth Creek; from this junction the North Fork winds irregularly westward to the eastern part of T. 18 N., R. 17 W., where it receives the South Fork. Below these forks the Noyo flows northwestward 2 miles, then southwestward 2 miles to the point at which it enters the Pacific, half a mile west of the town of Noyo; length of the river from the head of the Upper South Fork to the Pacific, including major windings, about 25 miles. The basin is traversed from Duffey to Fort Bragg by the California & Western Railroad & Navigation Co.'s railway. Punnett's map of Mendocino County.

Noyo River, North Fork. *See* Noyo River.

Noyo River, South Fork; Mendocino County; rises in the southeastern part of T. 18 N., R. 16 W., Mount Diablo base and meridian; takes a general northwesterly course to the eastern part of T. 18 N., R. 17 W., where it unites with the North Fork to form Noyo River; length, including major windings, 12 miles; principal tributaries, North Fork of the South Fork and an unnamed stream, 4 miles long, entering from the left, in the northern part of T. 17 N., R. 16 W. Punnett's map of Mendocino County.

Noyo River, South Fork, North Fork of; Mendocino County; rises in the southeasten part of T. 18 N., R. 16 W., Mount Diablo base and meridian; flows north of west 5 miles, then southward 1½ miles to its junction with the South Fork of Noyo River, through which it is tributary to Noyo River, and thus to the Pacific. Punnett's map of Mendocino County.

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Noyo River, Upper South Fork. *See* Noyo River.

Nuevo Canyon Creek; Ventura County; an intermittent stream, 1 mile long, flowing northward to Holser Canyon Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Nurse Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends northward from Montezuma Slough to a point west of Denverton. Antioch sheet.

Nutter Lake; Mono County; southeastern part of T. 3 N., R. 24 E., Mount Diablo base and meridian; no outlet shown; nearby lakes drain to East Fork of Green Creek (tributary through Green Creek to Virginia Creek and thus through East Walker River to Walker River, which discharges to Walker Lake); altitude, 9,550 feet. Bridgeport sheet.

Oak Bottom Creek; Siskiyou County; rises in the central part of T. 12 N., R. 7 E., Humboldt base and meridian; flows southwestward into Salmon River (tributary to Klamath River, which discharges to the Pacific), length, 6 miles. Punnett's map of Siskiyou County.

Oak Canyon Creek; San Diego River basin; rises in northeastern part of T. 15 S., R. 2 W., San Bernardino base and meridian, at altitude 850 feet above sea level; flows southerly into San Diego River, which discharges to the Pacific through False Bay; intermittent; length, 3½ miles; fall, 550 feet. La Jolla sheet.

Oak Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, about 1 mile long, rising in the southwestern part of T. 5 N., R. 17 W., San Bernardino base and meridian, and flowing northwestward into Santa Felicia Canyon Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Oak Creek; Inyo County; Inyo National Forest; formed in the northeastern part of T. 13 S., R. 34 E., Mount Diablo base and meridian, about 2 miles west of Old Camp Independence, by the union of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises on the east slope of the Sierra on Diamond Peak and Black Mountain; flows northeastward 3 miles, eastward, 4 miles, then southeastward one-half mile to its point of junction with the South Fork. The combined waters flow eastward 1½ miles to the edge of Owens Valley, where they sink; total fall from the highest source of the North Fork to the valley, 8,700 feet. Gaging station near Independence (1905–1911). Mount Whitney sheet.

Oak Creek, South Fork; Inyo County; Inyo National Forest; rises on the southeastern slope of Black Mountain, at altitude 11,500 feet above sea level; flows in general northeasterly to the northeastern part of T. 13 S., R. 34 E., Mount Diablo base and meridian; where it unites with the North Fork to form Oak Creek, which discharges into Owens Valley; length, about 8 miles; fall, 7,100 feet. Mount Whitney sheet.

Oak Spring Canyon Creek; Los Angeles County; rises in the southern part of T. 4 N., R. 14 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows northwestward to Santa Clara River (tributary to the Pacific); fall in the 2½ miles above the mouth of the canyon, 1,250 feet; intermittent. Fernando sheet.

Oat Canyon Creek; San Benito County; rises in the northern part of T. 19 S., R. 11 E., Mount Diablo base and meridian; flows southward into Lewis Creek (tributary through Bitterwater Creek to San Lorenzo Creek and thus to Salinas River, which discharges to Monterey Bay). Land Office map of California, 1907.

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Oat Creek; San Luis Obispo County. *See* Old Creek.

O'Hare Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 3 miles long, rising in the east-central part of Ex Mission San Buenaventura Rancho, at altitude 750 feet above sea level, and flowing southeastward to the edge of the valley of the Santa Clara (tributary to the Pacific) in Santa Paula y Saticoy Rancho; fall, 450 feet. Santa Paula sheet.

Oil Canyon Creek; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains, in T. 4 N., R. 25 W.; flows southward into Arroyo Parida (tributary to the Pacific); length, 2 miles; fall, about 1,300 feet. Santa Barbara special map.

Oil Creek; Santa Cruz and San Mateo counties; rises in the northwestern part of T. 8 S., R. 2 W., Mount Diablo base and meridian, at altitude 2,500 feet above sea level; flows westward 2 miles, then southwestward 3 miles into Pescadero Creek, which discharges to the Pacific; fall, 2,000 feet. Santa Cruz sheet.

Olancha Creek; Inyo County; Kern National Forest; rises on the south slope of Olancha Peak, at altitude 10,000 feet above sea level; flows north of east 7 miles to the edge of Owens Valley at Olancha, where its waters sink; fall, 6,350 feet, of which 5,000 feet is made in the first 3 miles. Olancha sheet.

Old Creek; San Luis Obispo County; rises in the Santa Lucia Mountains, in T. 28 S., R. 11 E., Mount Diablo base and meridian; flows southwestward, and enters the Pacific 1½ miles southeast of Cayucos; principal tributary, Cottontail Creek; called Oat Creek on the Land Office map. Cayucos sheet.

Old Man Canyon Creek; Santa Barbara and Ventura Counties; rises in the northeastern part of T. 5 N., R. 23 W., San Bernardino base and meridian, on Old Man Mountain; flows south of east into Matilija Creek (Ventura River, which discharges to the Pacific); length, about 3 miles. Mount Pinos sheet.

Old Nicholas Canyon Creek; Riverside County; an intermittent stream, about 2 miles long, discharging southeastward toward Rockhouse Canyon Creek (tributary to Clark Lake, Colorado Desert). Indio special sheet.

Oldwomans Creek; San Mateo County; an intermittent stream, 2 miles long, rising in the southeastern part of T. 8 S., R. 4 W., Mount Diablo base and meridian, and flowing westward into Gazos Creek (tributary to the Pacific). Santa Cruz sheet.

Olema Creek; Marin County; rises on the west slope of Bolinas Ridge, in Tomales y Bolinas Rancho, at altitude 1,300 feet above sea level; flows southwestward 1½ miles, and northwestward 8 miles to Point Reyes, where it enters Tomales Bay; 850 feet of the total fall occurs in the first mile and a half of its course. Tamalpais sheet; Punnett's map of Marin County.

Olivera Canyon; Santa Barbara County; in T. 9 N., R. 32 W., San Bernardino base and meridian; opens northward toward Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Omstott Creek; Riverside County; an intermittent stream, about 8 miles long, flowing northwestward to Palm Canyon Creek (which discharges to the Colorado Desert). Indio special sheet.

Oneida Lake; Mono County; southwestern part of T. 2 N., R. 25 E., Mount Diablo base and meridian; inlet, Lake Canyon Creek; outlet, Lake Canyon Creek through Crystal and Blue lakes to Mill Creek (tributary to Lake Mono); altitude, 9,550 feet; above Crystal Lake, about 50 feet. Mount Lyell sheet.

Oneill Creek; a channel in the tidal marsh in the southern end of San Francisco Bay. San Mateo sheet.

Onlauf Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2 miles long, rising on the south slope of Santa Paula ridge in T. 4 N., R. 21 W., San Bernardino base and meridian, and flowing south of

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west into Santa Paula Creek (tributary to Santa Clara River, which discharges to the Pacific). Santa Paula sheet.

Oriflamme Creek; San Diego County; northwestern part of T. 14 S., R. 5 E., San Bernardino base and meridian; an intermittent stream flowing northeastward toward the desert in the northwestern part of T. 14 and the southwestern part of T. 13 S., R. 5 E. Ramona and Cuyamaca sheets.

Oro Fino Creek; Siskiyou County; rises in the western part of T. 43 N., R. 9 W., Mount Diablo base and meridian; flows east of north 3 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County (on which it is not named) and Land Office map of California, 1907.

Oro Grande Wash; San Bernardino County; a Mohave Desert drainage way. Hesperia sheet.

Orr Creek; Mendocino County; rises in the west-central part of T. 15 N., R. 13 W., Mount Diablo base and meridian; flows northeastward 2 miles, then eastward 5 miles into Russian River (tributary to the Pacific) near Ukiah. Punnett's map of Mendocino County.

Oso Creek; Orange County; an intermittent stream rising in the northern part of Trabuco Rancho and flowing west of south about 6 miles; the drainage line is broken, but is apparently continued southwesterly through Canada Salada and joins the Pacific 1½ mile northwest of San Juan Capistrano Point. Corona and Capistrano sheets.

Oso Flaco; San Luis Obispo County, a marshy creek in Guadalupe Rolsa de Chamisal Rancho; flows northwestward to Oso Flaco Lake, a brackish-water body lying just east of the coast. Arroyo Grande sheet.

Oso Flaco Lake; San Luis Obispo County; a brackish-water body in the northwestern part of Guadalupe Rancho one-quarter mile east of the coast; receives the drainage of Oso Flaco. Arroyo Grande sheet.

Otay Reservoir; San Diego County; on Otay Creek, 22 miles southeast of San Diego, 10 miles back from the coast and about 5 miles north of the Mexican boundary. The lower reservoir forms one of a series of four projected by the Southern California Mountain Water Co. to impound water for the cities of San Diego and Coronado and for irrigation of extensive areas of frostless mesa lands adapted to citrus fruit culture. Lower Otay reservoir was completed in August, 1897. Outlet from the reservoir is provided by a circular tunnel through a narrow part of the enclosing ridge 1,000 feet west of the dam. The reservoir is supplied in part by water from the Cottonwood Creek basin diverted at the Barrett dam by a canal about 13 miles long, which carries it to Dulzura Creek and thence down Jamul Creek to the reservoir. Cuyamaca sheet; Schuyler, James D., Reservoirs for irrigation, water power, and domestic water supply, 2d ed., 1908, pp. 12–28.

Otay River; San Diego County; an intermittent stream draining the area north of Tia Juana River and south of Sweetwater River; fed by intermittent streams draining canyons extending northward from Otay Mesa; carries water to San Diego Bay only during flood stages. Cuyamaca and San Diego sheets.

Outlet Creek; Mendocino County; rises in the southwestern part of T. 19 N., R. 13 W., Mount Diablo base and meridian; flows southwestward 1½ miles then northwestward 1 mile into Deep Creek (tributary to Eel River which discharges to the Pacific.) Punnett's map of Mendocino County.

Owens Creek; Trinity County; rises in the central part of T. 35 N., R. 10 W., Mount Diablo base and meridian; flows northeastward 3 miles to its junction with Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

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Owens Lake; Inyo County; a body of saline water about 75 square miles in area; principal inlet, Owens River (q. v.); no outlet; like Mono Lake, which lies 125 miles farther north and about 3,000 feet higher, it derives its water from the vicinity of Mount Lyell; altitude of the lake (determined by survey in 1905) 3,569 feet. Evaporation from the surface of the lake is estimated at considerably more than 46 inches annually.

The lake was originally described[1] as having an area of about 110 square miles, an average depth of 9 feet 10 inches, and a density of 1.051. The only known forms of animal life inhabiting the water were Infusoria, alkali shrimps (*Artemia salina*) and the larvæ of the alkali flies (Ephyara), which developed in great numbers; some of the conditions have materially changed within recent years. Mr. N. Wrinkle, superintendent of the soda works of the Inyo Development Company, in a personal communication to Willis T. Lee, one of the geologists of the United States Geological Survey, has furnished the following information:

"The density of the water has increased to a point where bicarbonate of soda precipitates during the winter months without concentration by evaporation. During the past three years—1902 to 1904—the surface of the lake has lowered at the rate of 2.5 feet per year, and it has lowered 16 feet since 1894. Throughout the ten years previous to this date the lake surface remained practically stationary. Formerly alkali flies developed in myriads, as described by various writers, but during the present season (1904), although the larvæ are as numerous as usual, the flies have failed to appear."

Gaging station near Olancha (1908–1912).

Authorities: Mount Whitney and Olancha sheets; Lee, W. T., Geology and water resources of Owens Valley, California: Water-Supply Paper U. S. Geol. Survey No. 181, 1906, pp. 6, 19–21.

Owens River; Mono and Inyo counties; rises among the high peaks of the Sierra, east of Mount Lyell and directly opposite the headwaters of San Joaquin River, at altitude nearly 12,000 feet above sea level; flows in general southeastward through the trough of the valley to Owens Lake, about 20 miles southeast of Mount Whitney and directly opposite the northern part of the Kern River basin. The total length of the river is about 125 miles—45 miles above the lower end of the canyon and 80 miles in Owens Valley.

The area drained by Owens River is south of Mono Lake basin and north of the arid region separating it from the Mohave Desert at the south. On the west it is bordered, for a distance of about 140 miles, by the main crest of the Sierra, which forms the divide between it and the basin of San Joaquin, Kings, and Kern rivers. Its eastern limit is determined by the White Mountains at the north and the Inyo Mountains at the south. The lengh of the basin is about 120 miles; its width is about 20 miles at the south and 30 miles at the north, and its total area, including Owens Lake, comprises approximately 2,800 square miles, of which about 1,100 square miles is east of the river.

The basin comprises a rough east-side mountain slope 5 or 6 miles wide, a valley floor about 6 miles wide, and a west-side slope ranging from 6 to 10 miles or more in width. The west-side area is made up of a very rugged and precipitous mountain slope, 4 or 5 miles wide, and a sloping alluvial plain composed of delta-fan surfaces ranging from 1 to 5 miles in width and lying at the foot of the mountains and west of the western margin of the valley. Owens Valley is smooth and ranges in altitude from 3,600 feet at the south end to about 4,100 feet at the north end. The crest of the east-side range of mountains averages about 6.000 feet higher than the valley floor. The west-side plain

[1] Loew, Oscar, Ann. Rept. U. S. Geog. Surveys W. 100th Mer., 1876, p. 189.

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consists of a porous granitic alluvium of considerable depth, and ranges in altitude from about 4,000 feet at the western valley margin to about 6,000 feet at the foot of the mountains. It has a fairly uniform slope of 400 to 600 feet to the mile. The eastern slope of the Sierra is very steep and rugged, and ranges in altitude from about 6,000 feet at the foot to 13,000 or 14,000 feet at the crest.

The eastern slope of the basin is practically barren of vegetation, except for scanty desert growth. The western slope has a very slight soil covering and only sparse timber growth, found chiefly along the water courses. All the western slope, a large part of the eastern slope, and the central part of Owens Valley, are included in national forests.

The mean annual precipitation in Owens River basin is very light, especially on the valley floor and the eastern slope. The only records available are for the valley and indicate that the mean annual precipitation there is about 5 inches. On the Sierra slope the precipitation probably increases with increase of latitude and certainly increases with increase of altitude. On the higher parts of the slope it is probably 30 to 40 inches and possibly more; and it occurs almost entirely as snow, whose melting feeds the numerous streams that issue from this slope. These streams usually have their minimum flow in February and their maximum in July. Their combined maximum is about ten times their combined minimum. There is about the same ratio of disparity in the monthly extremes of precipitation, but the seasons are reversed.

More than forty lateral streams, many of them, however, comparatively small, drain a part of the eastern slope of the Sierra and enter Owens River from the west. The principal tributaries, from north to south, are Rock, Pine, Horton, McGee, Birch, and Bishop creeks, heading opposite the San Joaquin basin; Coyote, Baker, Big Pine, Birch, Tinemaha, Taboose, Goodale, Division, Sawmill (Eightmile), Thibaut, Oak, Pine, and Symmes creeks, heading opposite Kings River basin; and Shepard, Bairs (Moffett), George, Hogbeck, Lone Pine, Tuttle, Richter, Cottonwood, and Ash creeks, heading opposite Kern River basin. No water enters Owens River from the east except during exceptionally heavy rainstorms, which are rare.

Nearly all the tributary streams rise in glacial lakelets and marshes which lie near the crest of the Sierra and serve to a certain extent as storage reservoirs in regulating the flow. The streams emerge from the mouths of their canyons at the base of the Sierra upon the porous alluvial plain, across which they flow to the Owens River channel in the trough of the valley. In this belt of débris the streams lose a large amount of water, part of which appears in numerous springs throughout the valley. Perhaps stronger evidence of the great loss by seepage is afforded by the broad belt of wet and somewhat boggy land which extends over a large part of the trough of the basin. Several artesian wells which have been sunk in the vicinity of Independence yield a strong flow and give convincing evidence of an artesian belt in the valley.

The fall of the streams is so great and their minimum flow is so large and reliably constant that many thousands of horsepower could be developed.

Owens Valley is extensively cultivated and particularly adapted to stock raising. Numerous diversions are made for irrigation at different points on Owens River and tributaries, particularly in the upper part of the valley. Considerable water is also used for irrigating meadow lands in Long Valley north of Owens River canyon, but it is returned to the river above the head of Owens Valley.

Gaging stations near Round Valley (1903–1912), near Tinemaha (1906–1912); near Lone Pine (1908–1912); near Citrus (1903–1906). For complete list of gaging stations in Owens River basin, see pages 241–242.

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Authorities: Mount Lyell, Mount Goddard, Bishop, Mount Whitney, and Olancha sheets; Water-Supply Paper U. S. Geol. Survey No. 300, pp. 23-25; see also Water-Supply Paper U. S. Geol. Survey No. 294, An intensive study of the water resources of a part of Owens Valley, California.

Owl Creek; Modoc County; rises on the east slope of Warner Mountains, 2 miles southeast of Warren Peak, at altitude 6,600 feet above sea level; flows north of east 6 miles and discharges into Middle Alkali Lake; fall, 1,900 feet. Alturas sheet.

Owl Dry Lake; San Bernardino County; in the Owl Mountains. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, pp. 45-46, on which Owl Springs are described.

Pacheco Creek; Contra Costa County; the channel through which Walnut Creek enters Suisun Bay. Carquinez sheet.

Pacheco Creek; Pajaro River basin; Santa Clara and San Benito counties; rises in the northern part of T. 9 S., R. 5 E., Mount Diablo base and meridian; flows southeastward 12 miles, southward about 5 miles, then in general southwestward 20 miles to the western part of T. 12 S., R. 4 E., where it unites with San Benito River to form Pajaro River, which discharges to the Pacific in Monterey Bay; principal tributaries, Canada del Bolindo, Felipe, and Vibonas creeks, Tequisquito Slough, and Llagas and Uvas creeks. Land Office map of California, 1907.

Packard Creek; Mendocino County; rises in the eastern part of T. 21 N., R. 17 W., Mount Diablo base and meridian; flows southwestward 2 miles, then somewhat north of west 3½ miles to De Haven, where it enters the Pacific. Punnett's map of Mendocino County.

Pacoima Creek; Los Angeles County; Los Angeles River basin; rises on the northwest slope of Gleason Mountain, in the San Gabriel Timber Land Reserve, at altitude 5,850 feet above sea level; flows westerly and southwesterly to the edge of San Fernando Valley; its mountain drainage area is 9½ miles long and 2 miles in maximum width, and the creek occupies a narrow gorge between 2 parallel ridges; its waters come to the valley near its extreme northern quarter about 4 miles northwest of the opening of Little Tujunga Creek, and flow in a broad wash far around into the middle of the plain; only in times of flood do the waters reach the main river above ground; length to the opening of the canyon, including major windings, about 15 miles, in which distance the fall is 4,600 feet. Tujunga and Fernando sheets; Irrigation in California [southern], by Wm. Ham. Hall, Sacramento, 1888, p. 384.

Pacoima Creek, North Fork; Los Angeles County; rises in the southwestern part of T. 4 N., R. 13 W., San Bernardino base and meridian, at altitude 4,750 feet above sea level; takes a circuitous but in general southwesterly course to its junction with Pacoima Creek (tributary to Los Angeles River, which discharges to the Pacific); length, 2 miles; fall, 1,350 feet. Fernando sheet.

Pacoima Creek, South Fork; Los Angeles County; rises about 1 mile west of Iron Mountain, at altitude 4,750 feet above sea level; flows north of west 2 miles into Pacoima creek (tributary to Los Angeles River, which discharges to the Pacific); fall, 1,650 feet. Fernando sheet.

Padre Barona Creek; San Diego County; rises in northwestern part of T. 14 S., R. 2 E., San Bernardino base and meridian, at altitude 2,500 feet above sea level; flows southwestward into San Vicente Creek (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; length, 7 miles; fall, about 1,900 feet. Cuyamaca sheet.

Padre Juan Canyon Creek; Ventura County; rises in the eastern part of T. 3 N., R. 24 W., at altitude 1,000 feet above sea level; flows southwestward to the Pacific at Pitas Point. Ventura sheet.

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Pajaro River; formed in the western part of T. 12 S., R. 4 E., Mount Diablo base and meridian, by the union of Pacheco Creek and San Benito River. San Benito River, which drains the larger area and is therefore considered the continuation of the Pajaro, rises in the central part of T. 19 S., R. 12 E., and flows northwestward to the point at which it receives Pacheco Creek; below this junction the course of the Pajaro is westward and southwestward to Monterey Bay, where it enters the Pacific; length from the bay to the head of San Benito River, about 100 miles; principal fributaries, Clear, McCoy, James, Rock Spring, Johnson, Stone, Pescadero, Rosario, and Cienaga creeks. San Benito River forms part of the boundary between San Benito and Santa Clara counties, and Pajaro River lies between Monterey and Santa Cruz counties. Gaging station at Watsonville (1911–12). Land Office map of California, 1907.

Palen Dry Lake; Riverside County; Tps. 4 and 5 S., Rs. 16 and 17 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, p. 79.

Palm Canyon Creek; Riverside County; rises in Vandeventer Flat, in T. 7 S., R. 4 E., San Bernardino base and meridian; flows northward to the Colorado Desert. The stream is perennial in part of its course and is fed by streams rising on the east slope of the San Jacinto Mountains. San Jacinto sheet; Water-Supply Paper U. S. Geol. Survey No. 225, 1909, p. 30.

Palm Canyon Creek; San Diego County; an intermittent stream, about 7 miles long, flowing eastward and southeastward to the western edge of Borego Valley, in the Colorado Desert. Ramona and Indio special sheets.

Palm Canyon Creek, West Fork; Riverside County; rises in the northwestern part of T. 6 S., R. 4 E., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows northeastward into Palm Canyon Creek, which discharges to the Colorado Desert; length, 6 miles; fall, 5,700 feet. San Jacinto sheet.

Palmdale Reservoir; Los Angeles County; northeastern part of T. 5 N., R. 12 W., San Bernardino base and meridian; occupies an enclosed depression due to an uplift of low hills along the north side of the San Andreas fault zone in such a way as to block the channels formerly draining into Antelope Valley. Except for the building of a levee to prevent overflow of the railroad right of way, practically no construction was necessary to convert this depression into a reservoir said to be 5,500 acre-feet in capacity. "Three years ago [1908?] a cloudburst carried away the headgates of the canal, and both the Palmdale Reservoir and its inlet have been dry except for such water as has accumulated in the reservoir during the winter as rainfall from the adjacent slopes." Water-Supply Paper U. S. Geol. Survey No. 278, 1911, pp. 14, 33–34.

Palmer Creek; Monterey County; a stream about 5 miles long, rising in the southern part of T. 19 S., R. 12 E., Mount Diablo base and meridian, and flowing southwestward to Priest Valley Creek (tributary through Lewis Creek to Bitterwater Creek and thus through San Lorenzo Creek to Salinas River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

Palomas Canyon Creek; Los Angeles County; an intermittent stream rising in the northwestern part of T. 5 N., R. 17 W., and flowing southeastward into Castac Valley, where its flood waters join those of Castac Creek (tributary to Santa Clara River, which discharges to the Pacific). Tejon and Santa Susana sheets.

Palomeras Creek; San Lorenzo Creek basin; Alameda County; rises in the southwestern part of T. 3 S., R. 1 W., Mount Diablo base and meridian, on the northern slope of Walpert Ridge, at altitude 1,500 feet above sea level; flows northwestward 5½ miles, then southwestward 1½ miles to Castro Valley, where

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it unites with Cull Creek to form San Lorenzo Creek (discharging into San Francisco Bay); fall, 1,300 feet; principal tributary, Eden Creek. Pleasanton and Haywards sheets.

Pamo Canyon Creek; San Diego County; rises in the eastern part of Guejito Rancho, at altitude 2,700 feet above sea level; flows southeastward into Bear Creek (tributary through Temescal Creek to Santa Ysabel Creek—San Dieguito River—which discharges to the Pacific); intermittent; length, 1½ miles; fall, about 1,000 feet. Ramona sheet.

Pamo Creek. *See* Temescal Creek.

Panamint Dry Lake; Inyo County; south end of Panamint Valley; between the Panamint Range and the Slate Range; dry except after heavy rain. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Panamint Dry Lake, Little; Inyo County; at the north end of Panamint Valley, between the Panamint Range and the Darwin Mountains; dry except after heavy rain. Water-Supply Paper U. S. Geol. Survey 224, 1909, Pl. I.

Paper Mill Creek; Marin County; rises in San Geronimo Rancho, at altitude 1,500 feet above sea level; flows northwestward 1 mile, westward 2¼ miles to the point at which it receives Lagunitas Creek, northwestward 7 miles, then irregularly westward 2 miles to the head of Tomales Bay, through which it enters the Pacific; 1,000 feet of the total fall is made in 1½ miles at the head; intermittent in this stretch; principal tributaries, Lagunitas and Nicasio creeks. Tamalpais sheet (on which this branch is unnamed), and Punnett's map of Sonoma and Marin counties.

Papoose Creek; Trinity County; rises in the western part of T. 34 N., R. 7 W., Mount Diablo base and meridian; flows westward 4 miles into Trinity River (tributary through Klamath River to the Pacific). Punnett's map of Trinity County.

Paradise Canyon Creek; Santa Barbara County; an intermittent stream, 2 miles long, rising on the northern slope of the Santa Ynez Mountains, in T. 5 N., R. 28 W., San Bernardino base and meridian, and flowing northward to Santa Ynez River (tributary to the Pacific). Santa Ynez sheet.

Paradise Creek; San Diego County; rises in the northern part of T. 11 S., R. 1 W., San Bernardino base and meridian, at altitude 1,100 feet above sea level; flows northward about 2 miles; sinks before reaching San Luis Rey River (tributary to the Pacific); fall, about 200 feet; intermittent. Ramona sheet.

Paradise Valley Creek; San Diego County; rises in the northeastern part of La Nacion Rancho, at altitude 400 feet above sea level; flows southwestward and enters the Pacific in San Diego Bay just south of National City; intermittent; length, about 6 miles. San Diego sheet.

Park Creek; Ventura County; rises on the north slope of Topatopa Mountains, in the northwestern part of T. 5 N., R. 20 W., San Bernardino base and meridian; flows northward and northwestward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 2 miles; fall, 1,500 feet. Mount Pinos sheet.

Parker Creek; Mono County; Mono National Forest; rises on the east slope of the Sierra, in the glaciers on Kuna and Parker Peaks, at altitude about 12,000 feet above sea level; flows northeastward about 10 miles to its junction with Rush Creek (tributary to Mono Lake); fall, about 5,300 feet, of which 3,500 feet is made in about 3 miles at the head, above Parker Lake. Mount Lyell sheet.

Parker Lake; Mono County; Mono National Forest; eastern part of T. 1 S., R. 25 E., Mount Diablo base and meridian; outlet, Parker Creek, which flows through the lake to its junction with Rush Creek (tributary to Mono Lake); altitude, 8,375 feet. Mount Lyell sheet.

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Parks Creek; Siskiyou County; rises near the northwestern part of T. 41 N., R. 6 W., Mount Diablo base and meridian, on the north slope of China Mountain; flows northeastward to the southwestern part of T. 42 N., R. 5 W., then irregularly northward to its junction with Shasta River (tributary to Klamath River, which flows to the Pacific); length, 18 miles; swampy in middle course. Shasta sheet; Punnett's map of Siskiyou County.

Par Value Lake; Mono County; south-central part of T. 3 N., R. 24 E., Mount Diablo base and meridian; 1 inlet; outlet, a stream, 1¾ miles long, flowing southeast and northeast to Green Lake (outlet through West Fork of Green to Green Creek, which is tributary through Virginia Creek to East Walker River, and thus to Walker River, which discharges to Walker Lake); altitude, 10,350 feet; very small. Bridgeport sheet.

Paterson Creek; Siskiyou County; rises in the southwestern part of T. 42 N., R. 10 W., Mount Diablo base and meridian; flows northeastward 11 miles, then northward 5 miles to its junction with Scott River, through which it is tributary to Klamath River, which discharges to the Pacific. Punnett's map of Siskiyou County.

Pato Canyon Creek; Santa Barbara County; an intermittent stream, 4 miles long, rising 1 mile northwest of Cuyama Peak and flowing northward to Cuyama River (Santa Maria River, which discharges to the Pacific) in Cuyama Valley. Mount Pinos sheet.

Patrick Creek; Del Norte County; rises in the southwestern part of T. 19 N., R. 4 E., Humboldt base and meridian; flows west of south 10 miles to its junction with Middle Fork of Smith River (tributary through Smith River to the Pacific) in the central part of T. 17 N., R. 3 E. Punnett's map of Del Norte County.

Patterson Canyon Creek; Mono County; rises in the western part of T. 5 N., R. 24 E., Mount Diablo base and meridian, at altitude 8,400 feet above sea level; flows north of east 2½ miles into Swager Creek (tributary through Buckeye Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); fall, about 1,600 feet; intermittent. Bridgeport sheet.

Patterson Creek; Alameda County; a channel in the tidal marsh at the southern end of San Francisco Bay, extending westward from Patterson Landing to Coyote Hill Creek. Haywards sheet.

Patterson Creek; Klamath River basin; Siskiyou County; rises in the northeastern part of T. 44 N., R. 10 W., Mount Diablo base and meridian, on the south slope of Scott Bar Mountain; flows southeastward 2 miles, then west of south 3 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Patterson Creek; Klamath River basin; Trinity County; rises in the central part of T. 34 N., R. 12 W., Mount Diablo base and meridian; flows west of south 3 miles into Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Pauma Creek; San Diego County; rises in the southern part of T. 9 S., R. 1 E., San Bernardino base and meridian, at altitude 5,400 feet above sea level; flows north of west about 2½ miles through French Valley, then irregularly southwestward 5 miles to the Pauma Indian Reservation, where its waters sink before reaching San Luis Rey River (tributary to the Pacific Ocean). According to Hall,[1] this is "one of the few never-failing streams of the county." Ramona sheet.

Peacock Creek; Contra Costa County; rises in the northwestern part of T. 1 N., R. 1 E., Mount Diablo base and meridian; flows south of west into Mount

[1] Irrigation in California [southern]: The second part of the report of the State Engineer of California on irrigation and the irrigation question, Sacramento, 1888, p. 46.

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Diablo Creek (tributary through Seal Creek to Suisun Bay). Mount Diablo sheet.

Peavine Canyon Creek; Los Angeles County; an intermittent stream, about 1½ miles long, draining a small area in the Santa Monica Mountains and flowing southward to the mouth of its canyon in Rodeo de las Aguas Rancho (drained by Ballona Creek). Santa Monica sheet.

Pecho Creek; San Luis Obispo County; an intermittent stream, 3 miles long, rising in the San Luis Range, 1 mile east of Saddle Peak, and flowing southwestward to the point at which it enters the Pacific; fall, about 1,250 feet. Port Harford sheet.

Pecwan Creek; Humboldt County; formed in the central part of T. 11 N., R. 3 E., Humboldt base and meridian, by the union of North and South forks. The North Fork rises in the eastern part of T. 12 N., R. 3 E., Humboldt base and meridian, and flows southwestward; the South Fork rises in the southwestern part of T. 12 N., R. 4 E., Humboldt base and meridian, and flows southwestward and westward; each of the forks is about 7 miles long. The creek below the junction is less than a mile long. Punnett's map of Humboldt County.

Pecwan Creek, North and South forks. *See* Pecwan Creek.

Peeler Lake; Mono County; northwestern part of T. 3 N., R. 23 E., Mount Diablo base and meridian; outlet, a stream, 1½ miles long, flowing eastward to Robinson Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); altitude, 9,581 feet; fall of outlet, 1,031 feet. Bridgeport sheet.

Pena Creek; Sonoma County; rises in the western part of T. 9 N., R. 10 W., Mount Diablo base and meridian, takes a circuitous but in general northeasterly course to its junction with Dry Creek (tributary to Russian River, which flows into the Pacific); length, including major windings, 10 miles; tributaries unnamed on the map. Punnett's map of Sonoma County.

Penitencia Creek; Coyote River basin; Santa Clara County; rises on the west slope of Poverty Ridge, at altitude 3,000 feet above sea level; flows south of west to the valley of Coyote River (tributary to San Francisco Bay) north of San Jose, then northwestward to its junction with the river in the tidal marsh at the southeastern end of San Francisco Bay; length, including major windings, about 18 miles; principal tributaries, Arroyo Aguague, Arroyo de los Coches, Calera, Scott, and Toroges creeks; part of this course lies through Alum Rock Canyon. Mount Hamilton and San Jose sheets.

Pennington Creek; San Luis Obispo County; rises on the west slope of the Santa Lucia Mountains, in T. 29 S., R 12 E., Mount Diablo base and meridian, at altitude 1,500 feet above sea level; flows southwestward 4 miles into Chorro Creek, which discharges to the Pacific through Morro Bay; fall, 1,350 feet. San Luis Obispo sheet.

Peppertree Canyon Creek; Ventura County; an intermittent stream, 3 miles long, flowing southeastward into the valley of Santa Clara River (tributary to the Pacific) 1½ miles north of Saticoy; fall above the edge of the valley, 650 feet. Santa Paula sheet.

Permanente Creek; Santa Clara County; rises in the eastern part of T. 7 S., R. 3 W., Mount Diablo base and meridian, on the northern slope of the Monte Bello Ridge, at altitude 1,800 feet above sea level; flows south of east 2½ miles, then northeastward toward the tidal marsh at southern end of San Francisco Bay; sinks near Mountain View. Palo Alto and Santa Cruz sheets.

Pescadero Creek; Pajaro River basin; San Benito County; rises in the southern part of T. 14 S., R. 5 E., Mount Diablo base and meridian; flows northwestward 2 miles, northeastward 5 miles, then southeastward 5 miles into San

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Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); tributary, Thompson Creek. Land Office map of California, 1907.

Pescadero Creek; San Mateo County; rises in the eastern part of T. 8 S., R. 3 W., Mount Diablo base and meridian, at altitude 1,700 feet above sea level; flows southwestward about 2 miles, then turns sharply and flows northwestward along the north base of Butano Ridge 8 miles, then very irregularly westward to the point at which it enters the Pacific 2 miles north of Pescadero Point; length, about 20 miles; principal tributaries, Oil, Slate, Peters, and Butano creeks; drains also a small area in Santa Cruz County; drainage area 60 square miles. Santa Cruz sheet; Santa Cruz folio (No. 163), Geol. Atlas U. S., p. 1.

Petaluma Creek; Sonoma County; rises in the southern part of T. 6 N., R. 7 W., Mount Diablo base and meridian; flows south of west 5 miles, then in general southeastward 18 miles to the point at which it enters San Pablo Bay; passes through the city of Petaluma. Punnett's map of Sonoma County.

Peter Creek; Sonoma County; rises in the eastern part of T. 11 N., R. 12 W., Mount Diablo base and meridian; flows southwestward 2 miles into Dry Creek (tributary through Russian River to the Pacific). Punnett's map of Sonoma County.

Peters Creek; Pescadero Creek basin; San Mateo County; rises in the central part of T. 7 S., R. 3 W., at altitude 2,000 feet above sea level; flows southwestward 5 miles into Pescadero Creek, which discharges to the Pacific; fall, 1,550 feet; tributary, Evans Creek. Santa Cruz sheet.

Peterson Canyon Creek; San Diego County; rises in the northeastern part of T 16 S., R. 3 E., San Bernardino base and meridian, at altitude 3,400 feet above sea level; flows somewhat south of west to its junction with Sweetwater River (tributary to the Pacific through San Diego Bay) in the northeastern part of T. 16 S., R. 2 E.; length, about 7 miles; fall, 1,900 feet; intermittent. Cuyamaca sheet.

Petes Creek; Lassen County; rises in the eastern part of T. 32 N., R. 13 E., Mount Diablo base and meridian, 8 miles east of Horse Lake, at altitude 5,500 feet above sea level; takes a general southerly course to its junction with Susan River (tributary to Honey Lake); length, about 24 miles; fall, 1,400 feet. The map (Honey Lake sheet) shows a discharge channel from Horse Lake to Petes Creek, but as the bottom of the outlet is about 10 feet above the usual level of the lake it is probably used only in years of exceptionally high rainfall. *See* Horse Lake. Honey Lake sheet.

Peytonia Slough; Solano County; in the tidal marsh on the north side of Suisun Bay; extends westward from Suisun Creek. Napa sheet.

Picayune Creek; Trinity County; rises in the eastern part of T. 39 N., R. 6 W., Mount Diablo base and meridian, on the west slope of Trinity Mountains, at altitude 6,200 feet above sea level; flows northwestward to its junction with Trinity River (tributary to Klamath River, which flows to the Pacific); length, 6 miles; fall, 3,200 feet. Shasta sheet.

Pico Canyon Creek; Los Angeles County; rises in the eastern part of T. 3 N., R. 17 W., San Bernardino base and meridian, on the north slope of Santa Susana Mountains, at altitude 3,000 feet above sea level; flows northwestward 1½ miles, northeastward 5 miles, then west of north 1½ miles to its junction with Santa Clara River (tributary to the Pacific) near the mouth of Placerita Creek; intermittent; delivers water to the river only in times of flood; fall in the 4 miles above the mouth of the canyon, 1,550 feet. Santa Susana sheet.

Piedra Blanca Creek; Ventura County; rises in the north-central part of T. 6 N., R. 22 W., San Bernardino base and meridian, on the east slope of Pine Mountain, at altitude 6,100 feet above sea level; flows southeastward 7 miles

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into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 3,100 feet; principal tributary, North Fork. Mount Pinos sheet.

Piedra Blanca Creek, North Fork; Santa Clara River basin; Ventura County; rises in the eastern part of T. 6 N., R. 22 W., San Bernardino base and meridian, near Pine Mountain Lodge; flows southerly into Piedra Blanca Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific); length, about 2 miles. Mount Pinos sheet.

Piedra de Lumbre Canyon Creek; San Diego County; rises in Santa Margarita y las Flores Rancho, at altitude about 600 feet above sea level; flows west of south 6 miles; unites with Las Pulgas Canyon Creek (tributary to the Pacific). San Luis Rey sheet.

Pieta Creek; Mendocino County; rises on the west slope of the Coast Range in the western part of T. 13 N., R. 10 W., Mount Diablo base and meridian; flows east of south 3 miles, then to the southwest, west, and northwest to its junction with Russian River (tributary to the Pacific) near Pieta; length, 9 miles; course circuitous. Punnett's map of Mendocino County.

Pilarcitos Canyon Creek; Monterey County; an intermittent stream draining a canyon opening northward toward Salinas Valley (drained by Salinas River, which enters the Pacific through Monterey Bay) 3½ miles southwest of Salinas. Salinas Valley map, sheet 1.

Pilarcitos Creek; San Mateo County; rises in T. 4 S., R. 6 W., Mount Diablo base and meridian, on the east slope of the Montara Mountains, 1 mile east of North Peak Mountain, at altitude 1,100 feet above sea level; flows north of east 1 mile; southeasterly 5½ miles passing through Pilarcitos Lake, then to the south and southwest 6 miles and enters the Pacific 1 mile northwest of the town of Halfmoon Bay. San Mateo and Santa Cruz sheets.

Pilarcitos Lake; San Mateo County; in T. 4 S., R. 5 W., east of the Montara Mountains; principal inlet, Pilarcitos Creek, which flows through the lake and discharges to the Pacific Ocean; receives many small, unnamed streams; altitude, 692 feet. San Mateo and Santa Cruz sheets.

Pilitas Creek; San Luis Obispo County; rises in the southeastern part of T. 29 S., R. 14 E., Mount Diablo base and meridian; flows southwestward into Salinas River, which discharges to the Pacific in Monterey Bay; length, about 6 miles. Land Office map of California, 1907.

Pilot Creek; Humboldt County; rises in the northeastern part of T. 4 N., R. 4 E. Humboldt base and meridian; flows in general east of south 18 miles, then westward 2 miles to its junction with Mad River (tributary to the Pacific). Punnett's map of Humboldt County.

Pine Canyon; Santa Maria River basin; extends northward from Graciosa Ridge toward Santa Maria Valley. Lompoc sheet.

Pine Canyon; Santa Ynez River basin; Santa Barbara County; a drainage way in the southern part of Jesus Maria Rancho, opening southward toward the valley of Santa Ynez River (tributary to the Pacific). Guadalupe sheet.

Pine Canyon Creek; Salinas River basin; Monterey County; a short, intermittent stream, flowing northeastward toward Salinas Valley (drained by Salinas River, which enters the Pacific in Monterey Bay) near Buena Vista School. Salinas Valley map, sheet 1.

Pine Canyon Creek; San Gabriel River basin; Los Angeles County; an intermittent stream, 1 mile long, rising in the southeastern part of T. 1 N., R. 9 W., San Bernardino base and meridian, and flowing westward into Big Dalton Canyon (tributary to San Gabriel River, which discharges to the Pacific). Pomona sheet.

Pine Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the western part of T. 1 N., R. 9 W., San Bernardino base and meridian, at

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altitude 2,000 feet above sea level; flows northwestward into San Gabriel River (tributary to the Pacific); length, about 1 mile; fall, 950 feet; intermittent. Pomona sheet.

Pine Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, 2 miles long, flowing southward and westward into Bear Canyon Creek (tributary through Castac Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Pine Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2 miles long, rising in the northern part of T. 4 N., R. 20 W., San Bernardino base and meridian, and flowing northeastward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Pine Creek; Eagle Lake basin; Lassen County; rises in the southeastern part of T. 31 N., R. 7 E., Mount Diablo base and meridian, at altitude 6,500 feet above sea level; flows northeastward to the eastern part of T. 33 N., R. 9 E., then takes a general southeasterly course to Gallatin where it enters Eagle Lake (no outlet); length, about 32 miles; fall, 1,385 feet. Lassen Peak and Honey Lake sheets.

Pine Creek; Klamath River basin; Humboldt County; rises in the southwestern part of Hoopa Valley Indian Reservation; flows irregularly northward to its junction with Klamath River (tributary to the Pacific) near Martins Ferry; length, about 12 miles. Punnett's map of Humboldt County.

Pine Creek; Owens River basin; Inyo County; Inyo National Forest; rises on the eastern slope of the Sierra in a small lake in Granite Park, at altitude 11,800 feet above sea level; takes a general northeasterly course to its junction with Rock Creek (tributary to Owens River, which discharges to Owens Lake); length, 16 miles; fall, 7,300 feet, of which 6,800 feet is made above Round Valley; principal tributaries, Morgan and Gable creeks. Gaging station near Round Valley (1903–1912). Mount Goddard sheet.

Pine Creek; Walnut Creek basin; Contra Costa County; rises in the northwestern part of T. 1 S., R. 1 W., Mount Diablo base and meridian, at altitude 900 feet above sea level; flows northwestward 7½ miles to Ygnacio Valley (drained by Walnut Creek to Suisun Bay) where its waters sink; fall, about 825 feet. Mount Diablo and Concord sheets.

Pine Creek, Big; Owens River basin; Inyo County; rises in the southeastern part of T. 9 S., R. 31 E., Mount Diablo base and meridian, on the east slope of Inconsolable Range, at altitude 12,500 feet above sea level; flows southeastward 5 miles, then in general somewhat north of east to Owens Valley near Big Pine; length, about 15 miles; fall, about 8,500 feet; principal tributaries, South Fork and Little Pine Creek. Gaging station near Big Pine (1903–1911). Bishop and Mount Goddard sheets.

Pine Creek, Big, South Fork; Inyo County; formed by a number of branching tributaries that head on the east slope of the Sierra at altitude about 12,500 feet above sea level; flows northeastward to its junction with Big Pine Creek (tributary to Owens Valley) in the southeastern part of T. 9 S., R. 32 E., Mount Diablo base and meridian; length to head of longest tributary, about 4 miles; fall, about 4,700 feet. Bishop sheet.

Pine Creek, Little; Owens River basin; Inyo County; rises on the east slope of the Sierra, 1½ miles west of south of the southeast end of T. 9 S., R. 32 E., Mount Diablo base and meridian, at altitude 12,000 feet above sea level; flows northeastward 7 miles to its junction with Big Pine Creek (tributary to Owens Valley); fall, 7,500 feet. Bishop sheet.

Pine Creek, Little; Owens River basin; Inyo County; Inyo National Forest; rises on the east slope of the Sierra 1 mile north of Kearsarge Pass, at

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altitude 12,000 feet above sea level; flows southeastward into Onion Valley, then in general somewhat north of east to Owens Valley near Independence, where its waters sink; length, 10 miles; fall, 8,000 feet; principal tributary, Pinyon Creek. Gaging station near Independence (1905–1911). Mount Whitney sheet.

Pine Gulch Creek; Marin County; rises in the northern part of Punta de los Reyes Rancho, at altitude 600 feet above sea level; flows southeastward 6 miles to the lower end of Paradise Valley, then turns abruptly and flows northeastward half a mile to Bolinas Lagoon, through which it is tributary to Bolinas Bay on the Pacific. Tamalpais sheet.

Pine Lake; Inyo County; Inyo National Forest; inlet and outlet, Pine Creek, which flows through the lake to join Rock Creek (tributary to Owens River, which discharges to Owens Lake); altitude, 9,600 feet. Mount Goddard sheet.

Pine Lakes; Inyo County; southwestern part of T. 9 S., R. 32 E., Mount Diablo base and meridian; a group of small lakes discharging through Big Pine Creek to Owens Valley; altitude, somewhat more than 10,000 feet above sea level. Mount Goddard and Bishop sheets.

Pine Valley Creek; San Diego County; rises in the southwestern part of T. 15 S., R. 5 E., San Bernardino base and meridian, at altitude about 4,200 feet above sea level; flows southwestward about 17 miles to the central part of T. 17 S., R. 3 E., where it unites with Cottonwood Creek (tributary to Tia Juana River, which discharges to the Pacific); fall, 2,600 feet; intermittent; drains a rough, rugged country. Gaging station near Jamul (1906–1908) Cuyamaca sheet.

Pinole Creek; Contra Costa County; rises in Boca de la Canada del Pinole Rancho, on the north slope of Briones Hills, at altitude 900 feet above sea level; flows northwestward to the point at which it enters San Pablo Bay; length, about 10 miles. Concord, San Francisco, and Napa sheets.

Pinos Creek; Pajaro River basin; San Benito County; rises in the southern part of T. 14 S., R. 9 E., Mount Diablo base and meridian; flows westward into Rosario Creek through which it is tributary to San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 6 miles; a northern tributary, unnamed on the map, is longer than the stream itself. Land Office map of California, 1907.

Pinos Creek; Salinas River basin; Monterey County; rises in the northern part of T. 21 S., R. 7 E., Mount Diablo base and meridian; flows northeastward 6 miles to King City, where it joins Salinas River (tributary to the Pacific in Monterey Bay). Land Office map of California, 1907.

Pinyon Creek; Inyo County; Inyo National Forest; rises on the east slope of the Sierra, half a mile north of Mount Bradley, at altitude 11,400 feet above sea level; flows northeastward 5 miles to its junction with Little Pine Creek, which discharges to Owens Valley; fall, 6,100 feet. Mount Whitney sheet.

Pipe Creek; Eel River basin; Humboldt County; rises in the north-central part of T. 5 S., R. 5 E., Humboldt base and meridian; flows northeastward to its junction with Eel River (tributary to the Pacific); length, 6 miles. Punnett's map of Humboldt County.

Pipe Creek; San Jacinto River basin; Riverside County; rises in the northwestern part of T. 6 S., R. 4 E., San Bernardino base and meridian, at altitude 6,600 feet above sea level; flows southwestward about 4 miles to the South Fork of San Jacinto River; fall, 2,000 feet. San Jacinto sheet.

Pipes Creek; San Bernardino County; rises in the northwestern part of T. 1 N., R. 3 E., San Bernardino base and meridian, at altitude 7,500 feet above sea

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level; flows easterly into Antelope Creek, which discharges to the Colorado Desert; length, about 12 miles; intermittent. San Gorgonio sheet.

Pirate Creek; Alameda Creek basin; Alameda County; an intermittent stream, about 2 miles long, rising in the northern part of T. 5 S., R. 1 E., Mount Diablo base and meridian, at altitude 1,350 feet above sea level, and flowing northward and northeastward into Alameda Creek (which discharges to San Francisco Bay) near the southern end of Sunol Valley; length, about 2½ miles; fall, about 1,050 feet. Pleasanton sheet.

Piru Creek; Santa Clara River basin; Ventura and Los Angeles counties; rises in Ventura County, in the northern part of T. 6 N., R. 22 W., San Bernardino base and meridian, on the north slope of Pine Mountain, at altitude 6,500 feet above sea level; takes a very irregular but in general easterly course to the southern part of T. 7 N., R. 18 W., then with many sharp bends and turns flows southward to its junction with Santa Clara River (tributary to the Pacific) near the town of Piru; including its major windings the creek is about 50 miles long; the drainage basin is mountainous and lies entirely within the Santa Barbara National Forest reserve; principal tributaries, Mutau, Lockwood, Canada de los Alamos, Fish, and Agua Blanca creeks. Gaging station near Piru (1911–12.) Mount Pinos, Tejon, and Camulos sheets.

Piru Creek, South Fork; Ventura County; rises in the northeastern part of T. 6 N., R. 22 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows northeastward 3 miles into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); falls, 1,200 feet. Mount Pinos sheet.

Pismo Creek; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains in Corral de Piedra Rancho; flows southwestward to Pismo, then east of south through a tidal marsh to the Pacific; principal tributary, Corral de Piedra Creek. Arroyo Grande sheet.

Pismo Lake; a brackish-water body at the north end of the tidal marsh through which Pismo Creek discharges to the ocean. Arroyo Grande sheet.

Pitcher Creek; Humboldt County; rises in the eastern part of T. 9 N., R. 1 E., Humboldt base and meridian, on the west slope of Trinity Mountain; flows westward into Maple Creek just above the head of Big Lagoon; length, 3 miles. Punnett's map of Humboldt County.

Piute Creek; Lassen County; rises in the southern part of T. 31 N., R. 11 E., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southward 4 miles, then southeastward 5 miles into Susan River (tributary to Honey Lake) near Susanville; fall, about 1,900 feet. Honey Lake sheet.

Placerita Creek; Los Angeles County; rises in the northeastern part of T. 3 N., R. 15 W., San Bernardino base and meridian; flows westward through Placerita Canyon, then northwestward to Santa Clara River (tributary to the Pacific) to which it delivers water only in times of flood; intermittent; fall from the head of Placerita Canyon to the river, 850 feet; principal tributary, Newhall Creek. Fernando and Santa Susana sheets.

Pleasant Valley Creek; Carson River basin; Alpine County; rises on the east slope of the Sierra near the summit of the divide separating Carson River waters from those flowing to Mokelumne River; takes a general northeasterly course to its junction with Markleeville Creek [Hot Springs Creek] (tributary through East Fork of Carson River to Carson River, which discharges to Carson Sink) near Markleeville; length, about 10 miles; fall, about 2,800 feet. Gaging station at Markleeville (1910–1912). Markleeville sheet.

Pleasant Valley Creek; Walnut Creek basin; Contra Costa County; rises in the northwestern part of Acalanes Rancho, at altitude 700 feet above sea level;

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flows southeastward 3 miles into Lafayette Branch of Walnut Creek (tributary through Walnut Creek to Suisun Bay); fall, 400 feet. Concord sheet.

Plum Canyon Creek; Los Angeles County; rises in the northern part of T. 4 N., R. 15 W., San Bernardino base and meridian, at altitude 2,250 feet above sea level; flows southwesterly and westerly into Deadman Canyon (tributary to Santa Clara River, which discharges to the Pacific); length to junction with Deadman Canyon, about 5 miles; fall in the upper 1½ miles, 500 feet; delivers water to Deadman Canyon only in times of flood. Fernando and Santa Susana sheets.

Plummer Creek; Alameda County; a channel in the tidal marsh at the southern end of San Francisco Bay. Haywards sheet.

Plummer Creek; Siskiyou County; rises in the eastern part of T. 37 N., R. 12 W., Mount Diablo base and meridian, on the north slope of New River Mountains; takes a general northerly course to its junction with Salmon River (tributary to Klamath River, which flows to the Pacific); length, about 4 miles. Punnett's map of Siskiyou County.

Plunge Creek; San Bernardino County; rises in the northeastern part of T. 1 N., R. 3 W., San Bernardino base and meridian, at altitude 5,400 feet above sea level; flows very irregularly southward to the wash of Santa Ana River (tributary to the Pacific), where its waters sink; length, about 7 miles; fall, 3,750 feet. Redlands sheet.

Poggi Canyon Creek; San Diego County; rises in the northern part of T. 18 S., R. 1 W., San Bernardino base and meridian, at altitude 600 feet above sea level; flows southwestward to Otay River (tributary to the Pacific through San Diego Bay); length, about 5½ miles; fall, 500 feet; intermittent. Cuyamaca and San Diego sheets.

Point Arena Creek; Mendocino County; rises in the western part of T. 12 N., R. 16 W., Mount Diablo base and meridian; flows westward, and enters the Pacific in Arena Cove; length, 3 miles. Punnett's map of Mendocino County.

Poison Lake; Lassen County; eastern part of T. 32 N., R. 7 E., Mount Diablo base and meridian; neither inlet nor outlet shown on the map; altitude, about 5,300 feet. Lassen Peak sheet.

Pole Canyon Creek; Ventura County; an intermittent stream, 5 miles long, rising on the south slope of Hopper Mountain and flowing southwesterly toward Santa Clara River (tributary to the Pacific) near Fillmore. Camulos sheet.

Pole Creek; Placer County; rises in the eastern part of T. 16 N., R. 15 E., Mount Diablo base and meridian, at altitude 8,400 feet above sea level; takes a general easterly course to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes); length, 4 miles; fall, 2,850 feet. Truckee sheet.

Polhemus Lake; Lassen County; central part of T. 30 N., R. 7 E., Mount Diablo base and meridian; neither inlet nor outlet shown on map; altitude, 6,200 feet. Lassen Peak sheet.

Poligue Canyon Creek; San Bernardino County; rises in the northeastern part of T. 2 N., R. 1 W., San Bernardino base and meridian, on southern slope of Delamar Mountain, at altitude 7,500 feet above sea level; flows southwestward 1½ miles toward Bear Lake (outlet, Bear Creek to Santa Ana River, which discharges to the Pacific); fall, 600 feet. San Gorgonio sheet.

Pomponio Creek; San Mateo County; rises in the southwestern part of T. 7 S., R. 4 W., Mount Diablo base and meridian, at altitude 800 feet above sea level; flows northwestward and westward 6 miles and enters the Pacific in Pescadero Rancho, 1½ miles south of San Gregorio. Santa Cruz sheet.

Pony Creek; Trinity County; rises in the central part of T. 37 N., R. 12 W., Mount Diablo base and meridian; flows southwestward 4 miles, then south-

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eastward 1½ miles into East Fork of New River (tributary through New River to Trinity River and thus to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Poorman Canyon; San Luis Obispo County; southern part of Corral de Piedra Rancho; opens southeastward to Corbett Canyon in the Arroyo Grande Creek basin. Arroyo Grande sheet.

Poplin Creek; Ventura County; an intermittent stream, rising in the northeastern part of T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing in general southerly into Coyote Creek (tributary to Ventura River, which discharges to the Pacific); about 3 miles long. Ventura sheet.

Poppet Creek; Riverside County; rises in the northern part of T. 4 S., R. 1 E., San Bernardino base and meridian, near the southern edge of Poppet Flat, at altitude 3,700 feet above sea level; flows in general southwesterly to its junction with San Jacinto River at San Jacinto; length, 6 miles; fall, 2,000 feet. San Jacinto sheet.

Porter Creek; Sonoma County; rises in the north-central part of T. 8 N., R. 10 W., Mount Diablo base and meridian; flows southeastward 6 miles to its junction with Russian River (tributary to the Pacific) in the southwestern part of T. 8 N., R. 9 W. Punnett's map of Sonoma County.

Portero Canyon Creek; Monterey County; rises in the southern part of T. 20 S., R. 5 E., Mount Diablo base and meridian; flows eastward and northward to its junction with Arroyo Seco (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 10 miles. Land Office map of California, 1907.

Posita Canyon Creek; Malibu Creek basin; Ventura and Los Angeles counties; an intermittent stream, about 6 miles long, rising in the Simi Hills, and flowing in general southerly into Medea Creek (tributary through Triunfo Creek to Malibu Creek, which discharges to the Pacific); principal tributary of Posita Canyon Creek, Cheeseboro Canyon Creek. Camulos sheet.

Post Creek; Trinity County; rises in the western part of T. 30 N., R. 12 W., Mount Diablo base and meridian, 1 mile southeast of Post Creek Mountain; flows southeastward 3½ miles, then southwestward 5 miles into Rattlesnake Creek (tributary through South Fork of Trinity River to Trinity and thus through Klamath River to the Pacific). Punnett's map of Trinity County.

Pothole Lake; Inyo County; Inyo National Forest; one-fourth mile southeast of Kearsarge Pass; neither inlet nor outlet shown on the map; the near-by areas drain eastward through Little Pine Creek to Owens Valley; altitude, 11,200 feet; very small. Mount Whitney sheet.

Potrero Creek; Colorado Desert; Riverside County; T. 2 S., R. 1 E., San Bernardino base and meridian; a stream, about 3 miles long, flowing southward into San Gorgonio Pass, which slopes eastward from a point east of Beaumont to the Colorado desert. San Jacinto sheet.

Potrero Creek; San Jacinto River basin; Riverside County; rises in the southeastern part of T. 3 S., R. 1 W., San Bernardino base and meridian, at altitude 2,300 feet above sea level; flows southeastward 2 miles, then southwestward 3 miles to the edge of San Jacinto Valley; fall, 800 feet. San Jacinto sheet.

Potrero Creek; Tia Juana River basin; San Diego County; rises in the northwestern part of T. 18 S., R. 4 E., San Bernardino base and meridian, on the east slope of Potrero Peak, at altitude 2,300 feet above sea level; flows southwestward 3 miles, then northwestward 2 miles into Cottonwood Creek (tributary to Tia Juana River, which discharges to the Pacific); fall, 1,450 feet; intermittent. Cuyamaca sheet.

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Poverty Canyon Creek; Ventura County; an intermittent stream, 1½ miles long, rising in the southern part of T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing southwestward into Los Sauces Creek (tributary to the Pacific) in Casitas Valley. Ventura sheet.

Powell Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, rising in the southeastern part of T. 10 N., R. 29 W., San Bernardino base and meridian, and flowing northward through Kelsey and Powell canyons to Cuyama River (Santa Maria River, which discharges to the Pacific); length to head of Kelsey Canyon, 8 miles. Santa Ynez and McKittrick sheets.

Powell Creek; Monterey County; rises in the central part of T. 22 S., R. 12 E., Mount Diablo base and meridian; flows southwestward 6 miles, then north of west 6 miles to Bitterwater Creek, which discharges to the valley of Salinas River (tributary to the Pacific in Monterey Bay). Land Office map of California, 1907.

Prairie Creek; Humboldt County; rises in the northern part of T. 12 N., R. 1 E., Humboldt base and meridian; flows southward about 12 miles to its junction with Redwood Creek (tributary to the Pacific) in the southern part of T. 11 N., R. 1 E. Land Office map of California, 1907. Called West Fork of Prairie Creek on Punnett's map of Humboldt County.

Prairie Fork. *See* San Gabriel River.

Preston Creek; Del Norte County; rises on the northwestern slope of Preston Peak, in T. 17 N., R. 5 E., Humboldt base and meridian; flows north of west 8 miles to its junction with Middle Fork of Smith River (tributary through Smith River to the Pacific) in the western part of T. 17 N., R. 4 E. Punnett's map of Del Norte County.

Price Creek; Humboldt County; rises in the southern part of T. 2 N., R. 2 W., Humboldt base and meridian; flows in general northeastward to its junction with Eel River (tributary to the Pacific); length, 8 miles. Punnett's map of Humboldt County.

Priest Valley Creek; Monterey County; rises in the northeastern part of T. 20 S., R. 12 E., Mount Diablo base and meridian; flows southwestward 2 miles, then northwestward 2 miles to Lewis Creek (tributary through Bitterwater Creek to San Lorenzo Creek and thus to Salinas River, which discharges to Monterey Bay) at the town of Priest Valley; principal tributary, Palmer Creek. Land Office map of California, 1907.

Pringle Canyon Creek; San Diego County; rises in the south-central part of T. 17 N., R. 2 E., San Bernardino base and meridian, at altitude 1,500 feet above sea level; flows southwestward into Dulzura Creek (tributary to Jamul Creek, which discharges to Lower Otay reservoir); length, about 2 miles; fall, 500 feet; intermittent. Cuyamaca sheet.

Prospect Creek; Trinity County; rises in the northern part of T. 28 N., R. 11 W., Mount Diablo base and meridian; flows very irregularly southward to its junction with South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, about 5 miles. Punnett's map of Trinity County.

Prosser Creek; Gualala River basin; Sonoma County; rises in the southeastern part of T. 11 N., R. 13 W., Mount Diablo base and meridian; flows irregularly westward 4 miles, then south of west about 3 miles to its junction with Buckeye Creek, through which it is tributary to Gualala River (tributary to the Pacific). Punnett's map of Sonoma County.

Prosser Creek; Truckee River basin; Nevada County; formed in the western part of T. 18 N., R. 16 E., Mount Diablo base and meridian, by the union of its North and South forks. The North Fork, which drains the larger area and

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is therefore considered the continuation of the main stream, rises in a small lake, at altitude 7,400 feet above sea level, in the southeastern part of T. 18 N., R. 14 E., and flows in general east and southeast to the point of junction with South Fork; below the forks Prosser Creek flows northeastward about 2 miles, then southeastward 6 miles to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes) near Prosser; length to head of North Fork, about 14 miles; fall from head of North Fork to Truckee River, 1,800 feet, of which 900 feet is made in the first 2 miles at the head; principal tributary below the forks, Alder Creek. Gaging stations near Truckee (1903–1904, 1907–1912) and near Boca (1902–1903). Truckee sheet.

Prosser Creek, South Fork; Nevada County; rises in the northeastern part of T. 17 N., R. 14 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows southeastward 1 mile, then northeastward 4 miles to its junction with the North Fork with which it forms Prosser Creek (tributary to Truckee River, which discharges to Pyramid and Winnemucca lakes); fall, 2,200 feet. Truckee sheet.

Pudding River; Mendocino County; rises in the southeastern part of T. 19 N., R. 16 W.; Mount Diablo base and meridian; flows northwestward 4 miles, then in turn southwestward, southward, westward, and northwestward to the point at which it enters the Pacific in the extreme northeastern part of T. 18 N., R. 18 W.; length, about 12 miles. Punnett's map of Mendocino County.

Puerco Canyon Creek; Los Angeles County; an intermittent stream, 1½ miles long, rising on the southern slope of the Santa Monica Mountains, in the southeastern part of T. 1 S., R. 18 W., San Bernardino base and meridian, and flowing east of south into the Pacific Ocean. Camulos sheet.

Pulga Canyon Creek; Los Angeles County; an intermittent stream. 2½ miles long, draining a small area in the Santa Monica Mountains and flowing southward to the Pacific through Santa Monica Bay. Calabasas sheet.

Pulgas Creek; San Mateo County; rises in Pulgas Rancho, 2 miles east of Crystal Springs Lake, and flows northeastward toward the tidal marsh at the southern end of San Francisco Bay. Santa Cruz and San Mateo sheets.

Purisima Canyon; Santa Barbara County; a drainage way in Mission la Purisima, opening southeastward toward the valley of Santa Ynez River (tributary to the Pacific) north of Lompoc. Lompoc sheet.

Purisima Creek; San Mateo County; rises in the northwestern part of T. 6 S., R. 4 W., San Bernardino base and meridian, at altitude 1,500 feet above sea level; flows north of west 3 miles, then southwestward 4 miles and enters the Pacific near Purisima. Santa Cruz sheet.

Pyramid and Winnemucca lakes;[1] Washoe and Humboldt counties, Nev.; occupy two long, narrow basins and receive the waters of Truckee River, which sends a stream to each lake.

The first published account of the bifurcation of Truckee River so as to supply two lakes is given by King,[2] who says:

"At the time of our first visit to this region, in 1867, the river bifurcated; one half flowed into Pyramid Lake, and the other through a river 4 or 5 miles long into Winnemucca Lake. At that time the level of Pyramid Lake was 3,890 feet above the sea, and of Winnemucca about 80 feet lower. Later, owing to the disturbance of the balance between influx and evaporation already alluded to as expressing itself in Utah by the rise and expansion of Great Salt Lake, the basin of Pyramid Lake was filled up, and a backwater overflowed

[1] Abstracted from Russell, I. C., Geological history of Lake Lahontan, a Quaternary lake of northwestern Nevada: Mon. U. S. Geol. Survey, vol. 11, 1885, pp. 56–66.

[2] U. S. Geol. Expl. 40th Par., vol. 1, 1878, pp. 505–506.

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the former region of bifurcation, so that now the surplus waters all go down the channel into Winnemucca Lake, and that basin is rapidly filling.

"Between 1867, the time of my first visit, and 1871, the time of my last visit, the area of Winnemucca Lake had nearly doubled, and it has risen from its old altitude about 22 feet, Pyramid Lake in the same time having been raised about 9 feet. The outlines as given upon our topographical maps are according to the survey of 1867, and form interesting data for future comparison."

The differences in elevation between Pyramid and Winnemucca lakes as reported by King and determined by Russell in 1882 are as follows:

In 1867 Pyramid was 80 feet higher than Winnemucca; in 1872 Pyramid was 67 feet higher than Winnemucca; in 1882 Pyramid was 12 feet higher than Winnemucca, as determined by engineer's level; in 1890, when the region was surveyed by the topographers of the United States Geological Survey, Pyramid was but 5 feet higher than Winnemucca. The waters of both lakes are alkaline and brackish. Their shores, like those of all the lakes in the lower portion of the Great Basin, are clothed only with scanty growths of desert vegetation.

In the southern part of Pyramid Lake the water is slightly discolored by multitudes of shining particles that are rendered visible when a ray of light is passed through it. The lack of transparency is apparently due to the suspended silt brought down by Truckee River. In the northern part of the lake the water is wonderfully clear, and at some distance from the land is deep blue in color.

The largest islands in Pyramid Lake are Pyramid and Anaho, which rise in its southern part near the eastern shore. Anaho Island rises 480 feet above the water level of 1890, and is surrounded by water 150 to 300 feet deep. Pyramid Island rises 320 feet above the water level of 1890 and the water near its base is 150 to 175 feet deep.

Authorities: Reno, Wadsworth, and Granite Range sheets; Water-Supply Paper U. S. Geol. Survey No. 290, 1912, pp. 179–180.

Quail Canyon Creek; San Diego County; rises in the northwestern part of T. 15 S., R. 1 W., San Bernardino base and meridian, at altitude 700 feet above sea level; flows southeastward into Sycamore Canyon Creek (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; length, 1½ miles; fall, 325 feet. La Jolla sheet.

Quail Lake; Los Angeles County; in the eastern part of T. 8 N., R. 18 W., San Bernardino base and meridian; usually dry part of year; lies in a completely closed depression. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 14 and Pl. VI; Tejon sheet.

Quartz Creek; Del Norte County; rises in the northwestern part of T. 16 N., R. 4 E., Humboldt base and meridian, flows southwestward into the South Fork of Smith River (tributary to Smith River, which flows to the Pacific); length, 10 miles. Punnett's map of Del Norte County.

Quatal Canyon; Santa Maria River basin; Ventura and Santa Barbara counties; southern part of T. 9 N., Rs. 23 and 24 W., San Bernardino base and meridian; opens westward to Cuyama River (Santa Maria River, tributary to the Pacific Ocean). Mount Pinos sheet.

Rabbit Canyon Creek; Orange County; rises in the southeastern part of Lomas de Santiago, at altitude 1,400 feet above sea level; flows northwestward into Santiago Creek (tributary to Santa Ana River, which discharges to the Pacific); length, about 6 miles; fall, about 700 feet. Corona sheet.

Rabbitt Dry Lake; San Bernardino County; T. 4 N., R. 1 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

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Raider Creek; Modoc County; rises on the east slope of Warner Mountains, at altitude 6,000 feet above sea level; flows eastward 4 miles into the south end of Middle Alkali Lake; fall, 1,300 feet. Alturas sheet.

Ramera Canyon Creek; Los Angeles County; an intermittent stream, about 4 miles long, rising on the south slope of the Santa Monica Mountains, in the western part of T. 1 S., R. 18 W., and flowing southeastward into the Pacific Ocean. Camulos sheet.

Ramona Canyon Creek; Ventura County; an intermittent stream, 1 mile long, flowing northward to Holser Canyon Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Ramon Creek; Riverside County; T. 5 S., R. 5 E.; an intermittent stream, 1 mile long, flowing southeastward toward Dead Indian Creek, which discharges to the Colorado Desert. Indio special sheet.

Ranchero Creek; Sonoma County; rises in the northern part of T. 10 N., R. 12 W., Mount Diablo base and meridian; flows in general southeastward 6 miles to its junction with Warm Springs Creek (tributary through Dry Creek to Russian River, which flows into the Pacific). Punnett's map of Sonoma County.

Rancheria Creek; Mendocino County; rises in the northern part of T. 11 N., R. 12 W., Mount Diablo base and meridian; flows northwestward to the southeastern part of T. 14 N., R. 15 W., where it turns abruptly and flows east and north to the western part of T. 14 N., R. 14 W., where it unites with Anderson and Indian Creeks to form Navarro River (tributary to the Pacific); length, about 25 miles; none of the numerous small tributaries are named on the map. Punnett's map of Mendocino County.

Ranchial Creek; Monterey and San Luis Obispo counties; rises in the eastern part of T. 23 S., R. 13 E., Mount Diablo base and meridian; flows southwestward into Estrella Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 15 miles. Land Office map of California, 1907.

Rancho Nuevo Creek; Santa Barbara and Ventura counties; rises in the Santa Barbara National Forest, 4 miles southwest of Cuyama Peak, at altitude 5,000 feet above sea level; flows southeastward about 5 miles, then north of east 6 miles into Cuyama River (Santa Maria River, which discharges to the Pacific); fall, 1,500 feet; principal tributaries, Bear and Tinta creeks. Santa Ynez and Mount Pinos sheets.

Rathbone Creek; San Bernardino County; rises in the southeastern part of T. 2 N., R. 1 E., San Bernardino base and meridian, 1 mile northwest of Sugarloaf Mountain, at altitude 8,500 feet above sea level; flows northwestward 5 miles into Bear Lake (outlet, Bear Creek to Santa Ana River, which discharges to the Pacific); fall, 1,700 feet. San Gorgonio sheet.

Rattlesnake Canyon Creek; Mission Canyon basin; Santa Barbara County; an intermittent stream, 3 miles long, rising in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 2,750 feet above sea level, and flowing southwestward into Mission Canyon Creek (which discharges to the Pacific) near Santa Barbara Mission. Santa Barbara special sheet.

Rattlesnake Canyon Creek; Mohave Desert; San Bernardino County; rises in the western part of T. 2 N., R. 3 E., San Bernardino base and meridian, in Round Valley, at altitude 6,800 feet above sea level; flows southeastward 2½ miles, then northerly to the edge of Mohave Desert; principal tributaries, intermittent streams draining the south slopes of Granite Peak and the north slopes of Tiptop Mountain; the waters sink above Mound Spring but reappear in the spring. San Gorgonio sheet.

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Rattlesnake Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the northeastern part of T. 2 N., R. 9 W., San Bernardino base and meridian, on the east slope of Rattlesnake Peak, at altitude 5,500 feet above sea level; flows southeastward into San Gabriel River (tributary to the Pacific); length, 1½ miles; fall, 3,300 feet. Rock Creek sheet.

Rattlesnake Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 2 miles long, rising in the eastern part of T. 9 N., R. 31 W., San Bernardino base and meridian, and flowing west of south into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Rattlesnake Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 2 miles long, rising in the northwestern part of Sisquoc Rancho and flowing southeastward to Labrea Creek (tributary through Sisquoc River to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Rattlesnake Creek; Eel River basin; Lake County; rises in the northern part of T. 19 N., R. 10 W., Mount Diablo base and meridian, on the south slope of Mount Hull; flows southeastward 6 miles into Eel River (tributary to the Pacific). Punnett's map of Lake and Mendocino counties.

Rattlesnake Creek; Eel River basin; Mendocino County; rises in the southeastern part of T. 23 N., R. 15 W., Mount Diablo base and meridian, on the northwest slope of Iron Peak; flows southwestward 2 miles, then northwestward and westward 9 miles to its junction with South Fork of Eel River (tributary to Eel River, which flows to the Pacific); principal tributaries, Grapevine, Brush, and Foster creeks. Punnett's map of Mendocino County.

Rattlesnake Creek; Klamath River basin; Trinity County; rises in the western part of T. 29 N., R. 11 W., Mount Diablo base and meridian; flows north of west 4½ miles, then to the west and southwest 7 miles to its junction with the South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); principal tributary, Post Creek. Punnett's map of Trinity County.

Rattlesnake Creek; Klamath River basin; Trinity County; rises in the northern part of T. 35 N., R. 11 W., Mount Diablo base and meridian; flows in general northeastward 3 miles, northwestward 4 miles, and southwestward 3 miles to the eastern part of T. 36 N., R. 12 W., where it enters North Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); distance between source and mouth in a straight line, only 4 miles. Punnett's map of Trinity County.

Rattlesnake Creek; Santa Margarita basin; San Diego County; western part of T. 9 S., R. 2 E., San Bernardino base and meridian; an eastward-flowing stream, about 2 miles long, discharging into the west side of Dodge Valley. Ramona sheet.

Ravenswood Slough; San Mateo County; in the tidal marsh at the southern end of San Francisco Bay. Palo Alto sheet.

Rawson Canyon Creek; Riverside County; an intermittent stream rising in the western part of T. 6 S., R. 1 W., San Bernardino base and meridian, and flowing southwestward; the drainage channel is continued below Rawson Canyon across Los Alamos Valley to Santa Gertrudis Creek (tributary to Santa Margarita River, which discharges to the Pacific). Elsinore sheet.

Rawson Creek; Inyo County; rises in the central part of T. 8 S., R. 32 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level; flows northeastward 7 miles to the edge of Owens Valley; fall, 5,500 feet. Bishop sheet.

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Reading Creek; Trinity County; rises in the western part of T. 31 N., R. 8 W., Mount Diablo base and meridian, on the southwest slope of Bully Choop Mountain; flows southwestward 2½ miles, then northwestward 12 miles to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific) near Douglas City. Punnett's map of Trinity County.

Reasoner Canyon Creek; Ventura County; an intermittent stream, 3 miles long, rising in the southwestern part of T. 5 N., R. 18 W., San Bernardino base and meridian, and flowing eastward to Piru Creek (tributary to Santa Clara River, which discharges to the Pacific). Camulos sheet.

Rector Canyon Creek; Napa County; rises in the eastern part of T. 7 N., R. 4 W., Mount Diablo base and meridian, on the south slope of Atlas Peak, at altitude 2,000 feet above sea level; flows irregularly westward to its junction with Conn Creek (tributary to Napa River, which discharges to San Pablo Bay) 2 miles east of Oakville; intermittent. Napa sheet.

Red Cap Creek; Humboldt County; rises in the northeastern part of T. 8 N., R. 6 E., Humboldt base and meridian, on the west slope of Trinity Mountains; flows northwestward to its junction with Klamath River (tributary to the Pacific) in the central part of T. 10 N., R. 5 E.; length, about 14 miles. Punnett's map of Humboldt County.

Red Lake; Carson River basin; Alpine County; 1 mile southeast of Red Lake Peak; 1 inlet; outlet, a stream 3 miles long, flowing northeastward to West Fork of Carson River (tributary through Carson River to Carson Sink); altitude, 7,850 feet; fall of outlet, about 750 feet. Markleeville sheet.

Red Lake; Walker River basin; Mono County; southeastern part of T. 8 N., R. 24 E., Mount Diablo base and meridian; inlet, East Fork of Green Creek; outlet, East Fork Green Creek to Green Creek (tributary through Virginia Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); altitude, about 8,700 feet above sea level; fall of outlet in the 1 mile above junction with West Fork, 400 feet; very small. Bridgeport sheet.

Red Mountain Creek; Eel River basin; Mendocino County; rises in the western part of T. 24 N., R. 16 W., Mount Diablo base and meridian, on the north slope of Red Mountain; flows northwestward 3 miles, then southwestward 3 miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Red Mountain Creek; Klamath River basin; Trinity County; rises in the northwestern part of T. 28 N., R. 11 W., Mount Diablo base and meridian; flows southwestward 3 miles into South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Red Mountain Creek; Owens River basin; Inyo County; Inyo National Forest; rises on the east slope of the Sierra north of Cardinal Mountain, at altitude 12,500 feet above sea level; flows northeastward to its junction with Tinemaha Creek (tributary to Owens Valley); length, about 7 miles; fall, about 7,500 feet. Bishop sheet.

Red Reef Canyon Creek; Ventura County; rises in the northeastern part of T. 5 N., R. 21 W., San Bernardino base and meridian, on the north slope of Topatopa Mountains, at altitude 5,500 feet above sea level; flows northward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific) at Ten Sycamore Flat; length, 2½ miles; fall, 2,900 feet. Mount Pinos sheet.

Redrock Canyon Creek; Santa Maria River basin; San Luis Obispo County; an intermittent stream, 2 miles long, rising in the southern part of T. 32 S., R. 19 E., Mount Diablo base and meridian, and flowing southward into Taylor

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Canyon Creek (tributary to Cuyama River—Santa Maria River). McKittrick sheet.

Redrock Canyon Creek; Santa Ynez River basin; Santa Barbara County; an intermittent stream, 5 miles long, rising 2 miles west of Little Pine Mountain and flowing southwestward into Santa Ynez River (tributary to the Pacific). Santa Ynez sheet.

Red Rock Creek; Lassen County; rises in the northeastern part of the county; flows southeastward, southward, and southwestward; sinks at the eastern edge of the Madeline Plains; length, about 16 miles. Honey Lake sheet.

Red Rock Creek; Santa Clara River basin; Ventura County; an intermittent stream, 4 miles long, rising in the northwestern part of T. 5 N., R. 19 W., San Bernardino base and meridian, and flowing east of south into Tar Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific). Tejon and Camulos sheets.

Redwood Creek; Eel River basin; Humboldt County; rises in the eastern part of T. 4 S., R. 2 E., Humboldt base and meridian; flows northeastward into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific); length, 6 miles. Punnett's map of Humboldt County.

Redwood Creek; Humboldt County; rises in the southeastern part of T. 4 N., R. 4 E., Humboldt base and meridian; flows northwestward to the northwestern part of T. 10 N., R. 1 E., where it enters the Pacific; length, including major windings, about 50 miles. The basin is very narrow and only three tributaries—Minor, Lucky, and Prairie creeks—are named on the map. Gaging stations near Korbel (1911–12) and at Orick (1911–12). Punnett's map of Humboldt County.

Redwood Creek; San Leandro Creek basin; Alameda County; rises on the northern slope of Redwood Peak, in San Antonio Rancho, at altitude 1,150 feet above sea level; flows southeastward 5½ miles to its junction with San Leandro Creek, which discharges through San Leandro Bay into San Francisco Bay; fall, 800 feet. Concord sheet.

Redwood Creek; San Mateo County; a channel in the southern end of San Francisco Bay, extending northeastward from a point near Redwood. Haywards sheet.

Redwood Creek; Tenmile River basin; Mendocino County; rises in the northeastern part of T. 19 N., R. 16 W., Mount Diablo base and meridian; flows in general southwestward into the South Fork of Tenmile River (tributary through Tenmile River to the Pacific); length, 4 miles. Punnett's map of Mendocino County.

Reesley Valley Creek; Walnut Creek basin; Contra Costa County; rises in the southern part of Canada del Hambre Rancho, at altitude 1,000 feet above sea level; flows southeastward 3½ miles to its junction with the Lafayette Branch of Walnut Creek (tributary through Walnut Creek to Suisun Bay); fall, 775 feet. Concord sheet.

Release Canyon Creek; Monterey County; rises in the southern part of T. 20 S., R. 6 E., Mount Diablo base and meridian; flows northward to its junction with Arroyo Seco (tributary to Salinas River, which discharges to Monterey Bay); length, about 12 miles. Land Office map of California, 1907.

Reservoir Canyon Creek; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains 2 miles south of west of Piney Ridge; flows northwestward to San Luis Obispo Creek (tributary to the Pacific). San Luis Obispo sheet.

Respini Creek; Santa Cruz County; a stream about 2¼ miles long, rising in Arroyo de la Laguna Rancho and flowing southwestward into the Pacific. Santa Cruz sheet.

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Resting Springs Dry Lake; Inyo County; near south base of Resting Springs Mountains; receives occasional flood waters from Amargosa River (q. v.). Water-Supply Paper U. S. Geol. Survey No. 224, 1909, pp. 14, 39–40, 41, and Pl. I.

Reversed Creek; Mono County; Mono National Forest; rises in the northeastern part of T. 2 S., R. 26 E., Mount Diablo base and meridian, in June Lake, at altitude 7,631 feet above sea level; flows irregularly southwestward 2½ miles, then northwestward half a mile into Rush Creek (tributary to Mono Lake) half a mile above the head of Silver Lake; fall, about 400 feet. Mount Lyell sheet.

Reyes Creek; Ventura County; rises in the northeastern part of T. 6 N., R. 23 W., San Bernardino base and meridian, on the northeast slope of Reyes Peak, Pine Mountain, at altitude 6,500 feet above sea level; flows northwestward to Cuyama River (Santa Maria River, which discharges to the Pacific); length, about 6 miles; fall, 2,800 feet. Mount Pinos sheet.

Rhett Lake; Modoc and Siskiyou counties, Cal., and Klamath County, Oreg.; no outlet; principal inflowing stream, Lost River; water fresh; lake navigable, but used for navigation only to slight extent; altitude, about 4,000 feet above sea level (4,143 feet in 1884–85); marshy at upper end; Lost River, which supplies Rhett Lake, was formerly connected by slough with Klamath River. The lake is about 12 miles long and 12 miles wide and maintains an area of 90,000 acres.

Authorities: Klamath and Modoc Lava Bed sheets; Water-Supply Paper U. S. Geol. Survey No. 146, 1905, pp. 98–99. See also annual reports of United States Reclamation Service.

Rice Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising in the central part of T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing northeastward to East Canyon Creek, which discharges through Gavin Canyon Creek to Wiley Canyon Creek (tributary to the valley between Placerita and Pico Canyon creeks). Santa Susana sheet.

Rice Canyon Creek; Ventura River basin; Ventura County; an intermittent stream, 1½ miles long, rising in the southwestern part of T. 5 N., R. 23 W., San Bernardino base and meridian, and flowing southeastward to Ventura River (tributary to the Pacific) in Ojai Valley. Ventura sheet.

Rice Creek; Lake County; rises in the southwestern part of T. 18 N., R. 8 W., Mount Diablo base and meridian; takes a general southwesterly course to its junction with Rice Fork of Eel River (tributary to Eel River, which discharges to the Pacific); length, about 8 miles. Punnett's map of Lake and Mendocino counties.

Rice Fork of Eel River; Lake County; rises in the northern part of T. 16 N., R. 8 W., Mount Diablo base and meridian; flows northwestward to its junction with Eel River (tributary to the Pacific); length, 16 miles; principal tributaries, Bear and Rice creeks. Punnett's map of Lake and Mendocino counties.

Richter Creek; Inyo County; Sequoia National Forest; rises on the east slope of the Sierra 3 miles southeast of Mount Langley at altitude 11,000 feet above sea level; flows northeastward to the edge of Owens Valley about 2 miles northwest of Owens Lake, where its waters sink; length, about 9 miles; fall, about 7,200 feet. Mount Whitney sheet.

Riggs Wash; San Bernardino County; T. 16 N., Rs. 9 and 10 E., San Bernardino base and meridian; a desert drainage way. Ivanpah sheet.

Rincon Creek; Ventura and Santa Barbara counties; rises in Ventura County, in the southwestern part of T. 5 N., R. 24 W., on the south slope of Santa Ynez Mountains, at altitude 4,500 feet above sea level; flows west of south to Rincon

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Point, where it enters the Pacific; length, about 9 miles; principal tributaries. East Fork, Sulphur, Laguna, and Casitas creeks. Ventura sheet.

Rincon Creek, East Fork; Ventura County; an intermittent stream, 1½ miles long, rising in the western part of T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing north of west into Rincon Creek (tributary to the Pacific). Ventura sheet.

Rio Hondo; Los Angeles County; rises southeast of Pasadena; flows southeastward to Paso de Bartolo, then southwestward into Los Angeles River (tributary to the Pacific) 3 miles southwest of Downey. Downey sheet; described by Wm. Ham. Hall in Irrigation in California [southern], p. 375, as belonging to the San Gabriel system and evidently receiving the percolation drainage from the western portion of the San Gabriel interior valley.

Ritchie Creek; San Diego County; rises in the central part of T. 13 S., R. 3 E., San Bernardino base and meridian, at altitude of 3,700 feet above sea level; flows southwestward 5 miles into San Diego River (tributary to the Pacific through False Bay); intermittent; fall, 2,450 feet. Ramona sheet.

Roach Creek; Humboldt County; rises in the northern part of T. 9 N., R. 2 E., Humboldt base and meridian; flows southeastward 1 mile, then northeastward 8 miles to its junction with Klamath River (tributary to the Pacific) Punnett's map of Trinity County.

Roaring River Slough; Solano County; in the tidal marsh on the north side of Suisun Bay, between Hammond and Wheeler islands. Antioch sheet.

Robber Creek; San Diego County; rises in the southeastern part of T. 8 S., R. 5 W., San Bernardino base and meridian, at altitude 2,300 feet above sea level; flows southeastward about 6½ miles into Deluz Creek, (tributary to Santa Margarita River, which discharges to the Pacific). San Luis Rey sheet.

Robert Crane Creek; Sonoma County; rises in the eastern part of T. 6 N., R. 7 W., Mount Diablo base and meridian; flows westward 8 miles to the head of Laguna de Santa Rosa through which it flows to Santa Rosa Creek, Russian River and the Pacific. Punnett's map of Sonoma County. Called Mill Creek on Land Office map of California, 1907.

Roberts Canyon Creek; Los Angeles County; rises in the eastern part of T. 2 N., R. 9 W., San Bernardino base and meridian, at altitude 2,750 feet above sea level; flows west of south into San Gabriel River (tributary to the Pacific); length, 1 mile; fall, 1,050 feet; intermittent. Pomona sheet.

Robinson Creek; Russian River basin; Mendocino County; rises in the southwestern part of T. 15 N., R. 13 W., Mount Diablo base and meridian; flows southeastward 5 miles, then in general somewhat north of east 5 miles to its junction with Russian River (tributary to the Pacific) near El Roble. Punnett's map of Mendocino County.

Robinson Creek; Walker River basin; Mono County; rises in the central part of T. 3 N., R. 23 E., Mount Diablo base and meridian, in Snow Lake, at altitude 10,150 feet above sea level; takes a general northeasterly course to its junction with East Walker River (tributary through Walker River to Walker Lake) near Bridgeport; length, about 22 miles; fall, 3,680 feet, of which 3,050 feet is made above Twin Lakes, through which the creek passes. Gaging station near Bridgeport (1910–1912). Bridgeport sheet.

Roble Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, 2 miles northwest of Strawberry Peak, at altitude 5,300 feet above sea level; flows east of south 7 miles into Mono Creek (tributary to Santa Ynez River, which discharges to the Pacific); fall, 2,800 feet; Santa Ynez sheet.

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Rock Canyon Creek; Riverside County; an intermittent stream, about 2 miles long, flowing northwestward toward the valley of Palm Canyon Creek, which discharges to the Colorado desert. Indio special sheet.

Rock Creek; Eel River basin; Mendocino County; rises in the northwestern part of T. 21 N., R. 15 W., Mount Diablo base and meridian; flows south of west about 3½ miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Rock Creek; Klamath River basin; Klamath County, Oreg.; rises in the western part of the county; flows south of east into the western channel connecting Cherry Creek with Sevenmile Creek (tributary to Upper Klamath Lake and thus to Klamath River, which discharges to the Pacific); length, 7 miles. Ashland sheet.

Rock Creek; Klamath River basin; Siskiyou County; rises in the northern part of T. 13 N., R. 4 E., Humboldt base and meridian; flows eastward 8 miles, then in general southeastward 4 miles to its junction with Klamath River (tributary to the Pacific) near Healds. Punnett's map of Siskiyou County.

Rock Creek; Owens River basin; Inyo County; Inyo National Forest; rises on the east slope of the Sierra north of the Bear Spine, at altitude 12,200 feet above sea level; flows east of north into the southern part of Mono County, then turns and flows east and southeast to its junction with Owens River in the north-central part of T. 6 S., R. 31 E., Mount Diablo base and meridian; more than 20 miles long; fall, about 7,700 feet; principal tributary, East Fork; upper part of basin contains many small lakes. Gaging station near Round Valley (1903–1912). Mount Goddard sheet.

Rock Creek; Rhett Lake basin; Modoc County; rises in the extreme northern part of the county; takes a general westerly course; sinks before reaching Lost River (tributary to Rhett Lake); length, about 8 miles; intermittent. Alturas and Modoc Lava Bed sheets.

Rock Creek; Walker River basin; Mono County; rises in the northwestern part of T. 7 N., R. 24 E., Mount Diablo base and meridian, at altitude 9,000 feet above sea level; flows west of north 2½ miles, then westward 4½ miles to its junction with West Walker River (tributary to Walker River, which discharges to Walker Lake); fall, 3,500 feet; principal tributary, South Fork; middle course lies through Ross Canyon. Bridgeport and Wellington sheets.

Rock Creek; Smith River basin; Del Norte County; rises in the central part of T. 17 N., R. 1 E., Humboldt base and meridian, flows southward 3 miles into Smith River (tributary to the Pacific). Punnett's map of Del Norte County.

Rock Creek; Smith River basin; Del Norte County; rises in the southeastern part of T. 15 N., R. 1 E.; Humboldt base and meridian; flows somewhat east of north 7 miles into South Fork of Smith River (tributary to Smith River, which flows to the Pacific). Punnett's map of Del Norte County.

Rock Creek; Antelope Valley; Los Angeles County; rises in the rugged region north of North Baldy, at altitude 6,500 feet above sea level; flows northwestward past Shoemaker's ranch to the northwest corner of T. 4 N., R. 9 W., San Bernardino base and meridian, where it turns northward to the gravelly margin of Antelope Valley; breaks into several distributaries, which diverge from the apex of the alluvial fan built up by the stream itself; drainage area, 52 square miles. The more or less constant flow of Rock Creek is utilized by irrigation canals that extend for some distance east and west from the mouth of the canyon. Rock Creek sheet; Water-Supply Paper U. S. Geol. Survey No. 278, 1911, pp. 12, 33, and Pl. VI.

Rock Creek, East Fork; Owens River basin; Inyo County; Inyo National Forest; rises 1 mile east of Mount Morgan at altitude 12,200 feet above sea

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level; flows northeastward 2 miles, then northwestward 3 miles into Rock Creek (tributary to Owens River); fall, 2,900 feet; the basin contains many small lakes. Mount Goddard sheet.

Rock Creek Lake; Inyo County; Inyo National Forest; at lower end of Little Lakes Valley; inlet and outlet, Rock Creek, which flows through the lake to its junction with Owens River; altitude, 9,727 feet. Mount Goddard sheet.

Rock Creek, Little; Antelope Valley; Los Angeles County; rises in the mountainous country in T. 3 N., R. 10 W., San Bernardino base and meridian; flows northwestward and enters Antelope Valley near Little Rock in the northeast quarter of T. 5 N., R. 11 W.; drainage area, 78 square miles. The channel of this creek in Antelope Valley is better preserved than that of any of the other streams and is traceable to a point nearly 7 miles east of Lancaster. Here, however, it begins to lose its character and is not easily followed farther toward Rosamond dry lake. The waters of this stream are used to irrigate lands near the settlement of Little Rock. Gaging station near Palmdale (1896–1899). Rock Creek and Tujunga sheets; Water-Supply Paper U. S. Geol. Survey No. 278, 1911, pp. 12, 33–35, and Pl. VI.

Rock Creek, South Fork; Antelope Valley; Los Angeles County; heads in the region immediately north of Mount Islip, at altitude fully 8,000 feet above sea level; flows northward to its junction with Rock Creek. Rock Creek sheet; Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 12; Land Office map of California, 1907.

Rock Creek, South Fork; Walker River basin; Mono County; rises in the northwestern part of T. 7 N., R 24 E., Mount Diablo base and meridian, 1 mile west of the head of the main fork, at altitude 8,500 feet above sea level; flows northwestward into Rock Creek (tributary through West Walker River to Walker River, which discharges to Walker Lake) at the lower end of Ross Canyon; length, about 4 miles; fall, 2,500 feet. Bridgeport and Wellington sheets.

Rockhouse Canyon Creek; Riverside and San Diego counties; an intermittent stream rising on the south slope of Santa Rosa Mountains and flowing southeastward toward Clark Lake; length above the mouth of the canyon, 10 miles. Indio special sheet.

Rock Pile Creek; Mendocino and Sonoma Counties; rises in the southeastern part of T. 12 N., R. 13 W., Mount Diablo base and meridian; flows very irregularly southwestward into Gualala River (tributary to the Pacific); length, including major windings, 16 miles. Punnett's map of Mendocino and Sonoma counties.

Rock Spring Canyon Creek; Mono County; rises in the southern part of T. 6 N., R. 26 E., Mount Diablo base and meridian, at altitude 8,500 feet above sea level; flows southwestward 3 miles, then north of west 3 miles; intermittent; sinks before reaching East Walker River (tributary to Walker River, which discharges to Walker Lake) to which its basin is tributary; fall, 2,000 feet. Bridgeport sheet.

Rock Spring Creek; San Benito County; rises in southwestern part of T. 16 S., R. 10 E., Mount Diablo base and meridian; flows southwestward into San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 6 miles. Land Office map of California, 1907.

Rocky Glen Creek; Humboldt County; rises in the east-central part of T. 3 S., R. 4 E., Humboldt base and meridian; flows westward into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Rocky Gulch Creek; Siskiyou County; rises in the southeastern part of T. 47 N., R. 7 W., Mount Diablo base and meridian; flows somewhat north of

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east 3 miles to its junction with Cottonwood Creek (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Roden Canyon Creek; San Diego County; rises in the northern part of T. 12 S., R. 1 E., San Bernardino base and meridian, at altitude 1,800 feet above sea level; flows southward 5 miles into Santa Ysabel Creek (San Dieguito River, which discharges to the Pacific) 3 miles east of the head of San Pasqual Valley; intermittent; fall, 1,000 feet. Ramona sheet.

Rodeo Creek; Contra Costa County; rises in Pinole Rancho, on the west slope of Franklin Ridge, at altitude 800 feet above sea level; flows northwestward to Lost Tree Point, where it enters San Pablo Bay; length, about 7 miles. Concord, Carquinez, and Napa sheets.

Rodeo Lagoon; extreme southwestern part of Marin County on the Marin-Sausalito peninsula; connected with the ocean by a short channel; receives 2 unnamed tributaries. Tamalpais sheet.

Rodriguez Dry Lake; Kern County; Tps. 9 and 10 N., Rs. 9 and 10 W., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, pp. 64–65.

Rogers Canyon Creek; Los Angeles County; rises in the southern part of T. 2 N., R. 10 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows in general somewhat east of south 5 miles to San Gabriel River (tributary to the Pacific) near the head of San Gabriel Wash; fall, 2,500 feet; intermittent. Pomona sheet.

Rogers Dry Lake; Kern County; Tps. 8, 9 and 10 N., Rs. 9 and 10 W., San Bernardino base and meridian; contains water only during or immediately after heavy storms. At other times its bed is a smooth hard surface extending for many miles. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 14 and Pl. VI.

Romero Canyon Creek; Santa Barbara County. *See* Arroyo de las Ortegas.

Rosario Creek; San Benito County; rises in the western part of T. 14 S., R. 8 E., Mount Diablo base and meridian, south of Cerro del Venado; flows southward 3 miles, then to the west and northwest about 18 miles to its junction with San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay) 4 miles south of Hollister; principal tributaries, Pinos, Salt and Tosquin creeks. Land Office map of California, 1907.

Rose Canyon Creek; San Diego County; rises in the northern part of T. 15 S., R. 2 W., San Bernardino base and meridian, at altitude 700 feet above sea level; flows southwestward about 10 miles, then southeastward 3½ miles, and again southwestward 1½ miles to False Bay (through which it reaches the Pacific) 1 mile northeast of Bay Point; intermittent; length, about 15 miles; principal tributary, San Clemente Canyon Creek. La Jolla sheet.

Rose Valley Creek; Santa Clara River basin; Ventura County; rises in the central part of T. 5 N., R. 22 W., San Bernardino base and meridian; flows northwestward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 3 miles; tributary, Howard Creek. Mount Pinos sheet.

Rosamond Dry Lake; Kern and Los Angeles counties; Tps. 8 and 9 N., Rs. 11 and 12 W.; contains water only during the hardest storms; at other times its bed forms a smooth, hard surface covering a number of square miles. Water-Supply Paper U. S. Geol. Survey No. 278, 1911, p. 14 and Pl. VI.

Rough Creek; California-Nevada; rises in Mono County, in the northeastern part of T. 4 N., R. 26 E., Mount Diablo base and meridian, on the east slope of Potato Peak, at altitude 9,400 feet above sea level; flows northeastward 14 miles, then northwestward 7 miles to its junction with East Walker River (tributary to Walker River, which discharges to Walker Lake) in Mineral

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County, Nev.; fall, 3,800 feet; principal tributary, Bodie Creek. Bridgeport and Hawthorne sheets.

Round Corral Canyon Creek; Santa Barbara County; an intermittent stream, about 1 mile long, rising in the southern part of Sisquoc Rancho and flowing northward to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Round Lake; Klamath County, Oreg.; 6 miles south of Upper Klamath Lake and 5 miles north of Keno; no outlet shown on the map, but the contours indicate a pass westward and southward to Klamath River (tributary to the Pacific). Klamath sheet.

Round Spring Canyon Creek; Santa Maria River basin; Ventura County; an intermittent stream, 7 miles long, rising in the Santa Barbara National Forest in the southeastern part of T. 8 N., R. 23 W., San Bernardino base and meridian, and flowing southwestward to Cuyama River (Santa Maria River, which discharges to the Pacific). Mount Pinos sheet.

Round Valley Creek; Mendocino County; rises in the southern part of T. 24 N., R. 13 W., Mount Diablo base and meridian, in the Round Valley Indian Reservation; flows southeastward 16 miles to its junction with Middle Fork of Eel River (tributary to Eel River, which discharges to the Pacific); principal tributary, Williams Creek. Punnett's map of Mendocino County.

Rowdy Creek; Del Norte County; rises in the southeastern part of T. 19 N., R. 1 E., Humboldt base and meridian; flows southwestward 11 miles to its junction with Smith River (tributary to the Pacific) in the southern part of T. 18 N., R. 1 W. Punnett's map of Del Norte County.

Ruby Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising in the western part of T. 6 N., R. 15 W., San Bernardino base and meridian, northeast of Red Mountain, and flowing westerly into Elizabeth Lake Canyon Creek (tributary through Castac Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Rush Creek; Klamath River basin; Trinity County; rises in the southern part of T. 35 N., R. 10 W., Mount Diablo base and meridian, at altitude 5,200 feet above sea level; flows southeastward to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 12 miles; fall, about 3,500 feet. Red Bluff sheet.

Rush Creek; Mono Lake basin; Mono County; Mono National Forest; rises on the east slope of Mount Lyell (altitude, 13,090 feet); flows in general northeastward into Mono Lake; to the south, on the opposite side of the Sierra, are the headwaters of the North and Middle forks of the San Joaquin; west and north are the headwaters of Merced and Tuolumne rivers. The creek is fed by melting snow in hundreds of rock-inclosed tarns high up on the eastern slope of the Sierra between Mount Lyell and Mount Dana. Lakes are numerous in the basin, the most important being Marie, Gem, Silver, Gull, June, Alger, and Grant; principal tributaries, Reversed, Parker, and Walker creeks; the creek is about 22 miles long and its total fall is about 5,100 feet; in a distance of less than half a mile above the mouth of Reversed Creek there is a total fall of 1,100 feet; the drainage area above is small but storage could be developed in Gem Lake.

The rocks throughout the basin are chiefly granites and blue schist; the soil is composed of volcanic ash and sand and requires a large amount of water for irrigation. As the altitude of the tillable area is 6,500 to 7,000 feet above sea level the growing season is short and the crops are restricted to the hardier grains and hay. The forest is thin and contains only a small amount of merchantable timber, chiefly yellow pine. The uncultivated valley land is covered with sagebrush.

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Gaging station near Mono Lake (1910–1912).

Authorities: Water-Supply Paper U. S. Geol. Survey No. 290, 1912, pp. 147–148; Mount Lyell sheet.

Rush Creek, North Fork; Mono Lake basin; Mono County; Mono National Forest; rises on the south slope of Koip Peak, at altitude 11,500 feet above sea level; flows southeastward about 5 miles and joins Rush Creek (tributary to Mono Lake) in Silver Lake; fall, about 4,300 feet. Mount Lyell sheet.

Russian Creek; Siskiyou County; rises in the southern part of T. 41 N., R. 10 W., Mount Diablo base and meridian, on the west slope of Salmon Mountains; flows northwestward 2 miles, then in general southwestward 6 miles to its junction with the North Fork of Salmon River (tributary through Salmon River to Klamath River, which flows to the Pacific); principal tributary, Taylor Creek. Punnett's map of Siskiyou County.

Russian Creek, South Fork; Siskiyou County; rises in the northeastern part of T. 39 N., R. 10 W., Mount Diablo base and meridian; flows west of north 4 miles, then westward 4 miles into North Fork of Salmon River (tributary through Salmon River to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Russian Gulch Creek; Mendocino County; rises in the eastern part of T. 17 N., R. 17 W., Mount Diablo base and meridian, on the southwestern slope of Great Caspar Mountain; flows westward into the Pacific; length, 4 miles. Punnett's map of Mendocino County.

Russian Gulch Creek; Sonoma County; rises in the eastern part of Muniz Rancho; flows southwestward 2½ miles; enters the Pacific 3 miles northwest of the mouth of Markham Creek. Punnett's map of Sonoma County.

Russian River; Mendocino and Sonoma counties; rises in Mendocino County on the west slope of the Coast Range in the southwestern part of T. 18 N., R. 12 W.; Mount Diablo base and meridian; flows in general somewhat east of south to its junction with Santa Rosa Creek in Molino Rancho, where it turns to the west and enters the canyon through which it flows to the Pacific Ocean; length of the main river, including major windings, about 100 miles; principal tributaries, East Fork, Big Sulphur, Dry, Santa Rosa, and Austin creeks, all very small except during the rainy season.

Russian River valley in Sonoma County is fertile and well cultivated. The climate is very equable throughout the year and fruit raising is the important industry. As climate and soil are especially favorable for growing grapes, the valley has become one of the most important wine producing districts in California.

Gaging stations at Ukiah (1911–12) and Geyserville (1910–1912).

Punnett's map of Mendocino and Sonoma counties; Water-Supply Paper U. S. Geol. Survey No. 291, 1912, p. 174.

Russian River, East Fork; Mendocino County; rises on the west slope of the Coast Range in the southern part of T. 18 N., R. 12 W.; flows in general southeastward 6 miles, southward 5 miles, then southwestward 9 miles to its junction with Russian River (tributary to the Pacific) in Yokayo Rancho; principal tributaries, Alder and Cold creeks. Gaging station near Ukiah (1911–12). Punnett's map of Mendocino County.

Rustic Canyon Creek; Los Angeles County; an intermittent stream, about 8 miles long, draining a small area in the Santa Monica Mountains, and flowing in general southerly to Santa Monica Canyon (which discharges to the Pacific in Santa Monica Bay) near Santa Monica. Calabasas sheet.

Ryans Creek; Humboldt County; rises in the west-central part of T. 4 N., R. 1 E., Humboldt base and meridian; flows northwestward about 3 miles, then

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somewhat east of north 5 miles; discharges into Humboldt Bay through Freshwater Slough. Punnett's map of Humboldt County.

Sacate Canyon Creek; Santa Barbara County; an intermittent stream, 1½ miles long, flowing southward and entering the Pacific just west of Sacate. Lompoc sheet.

Saddlebag Lake; Mono County; Tps. 1 and 2 N., Rs. 24 and 25 E.; inlet. Leevining Creek, which flows through the lake and discharges into Mono Lake; altitude, 10,051 feet. The lake is about 1½ miles long and nearly half a mile wide. Mount Lyell sheet.

Sage Canyon Creek; Napa County; rises in the central part of T. 8 N., R. 4 W., Mount Diablo base and meridian; flows southeastward 2 miles, then south of west 6 miles into Conn Creek (tributary through Napa River to San Pablo Bay). Napa sheet; Punnett's map of Napa County.

Sage Hen Creek; Nevada County; rises in the north-central part of T. 18 N., R. 15 E., Mount Diablo base and meridian, at altitude 8,500 feet above sea level; takes a general northeasterly course to its junction with Little Truckee River (tributary through Truckee River to Pyramid and Winnemucca lakes) in Stampede Valley; length, 12 miles; fall, 2,700 feet. Truckee sheet.

Salinas River; San Luis Obispo and Monterey counties; rises on the east slope of the Santa Lucia Mountains in San Luis Obispo County; flows northwestward parallel to the coast and enters the Pacific in Monterey Bay, about 4 miles south of Castroville. The basin lies almost wholly in Monterey and San Luis Obispo counties, and its area comprises about 4,780 square miles, being 150 miles long (northwest-southeast), and about 45 miles in maximum width.

Topographically it is a long narrow valley, walled in by steep mountain slopes which have been greatly eroded and dissected by stream action. At the north end of the basin are the Gabilan Range and the Sierra de Salinas, separating it from the San Benito basin at the east and from the basin of Carmelo River on the west. For the rest of its length it is flanked on the west by parallel ridges and on the southeast by a broad mesa or elevated plain. The crests of the encircling mountains range in altitude from 2,500 to 4,000 feet above sea level.

The river has many tributaries, the most important of which are, from south to north, Estrella and San Lorenzo from the east, Nacimiento Creek, San Antonio River, and Arroyo Seco from the west. The tributaries from the west are peculiar in that they lie west of secondary ranges parallel to the main range and flow southeastward for the greater part of their length in a course parallel to but directly opposite the general course of the Salinas. The streams of the basin are torrential and erratic, particularly the Salinas itself, which has a very heavy discharge in winter and ordinarily no surface run-off in summer except below Soledad.

The mean annual precipitation is about 10 inches in the Salinas Valley, and increases with the increase in altitude on the slopes. It is undoubtedly greatest on the west slope of the basin, where it probably ranges from 30 to 50 inches on the higher elevations and occurs almost entirely as rain.

The higher parts of the western slopes support considerable timber, most of which is included in a national forest reserve. The eastern slopes are covered by grass, brush, and scrubby timber, and in the valley are a few scattered trees.

The basin contains several storage sites of more or less value, some of which have already been surveyed.

Gaging station near Salinas (1900–1901).

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Authorities: Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 112–113; Land Office map of California, 1907; San Luis Obispo sheet.

Salisbury Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, at altitude 4,700 feet above sea level; flows northward across T. 9 N., R. 26 W., San Bernardino base and meridian, to Cuyama Valley (drained by Cuyama River, which discharges to the Pacific); intermittent; length above the edge of the valley, about 7 miles, in which distance the fall is 2,200 feet; tributary, Sulphur Spring Canyon Creek. Santa Yuez sheet.

Salmon Creek; Eel River basin; Humboldt County; rises in the southwestern part of T. 2 S., R. 2 E., Humboldt base and meridian; flows southeastward 6 miles, then northeastward 3 miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Salmon Creek; Eel River basin; Lake County; rises in the central part of T. 19 N., R. 11 W., Mount Diablo base and meridian; flows northeastward 2 miles, then southeastward 8 miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Lake and Mendocino counties.

Salmon Creek; Humboldt County; rises in the central part of T. 3. N., R. 1 E., Humboldt base and meridian; flows north of west 9 miles, then somewhat west of north about 4 miles to the western part of T. 4 N., R. 1 W., where it enters the south end of Humboldt Bay; marshy in lower course. Punnett's map of Humboldt County.

Salmon Creek; Mendocino County; rises in the southern part of T. 16 N., R. 16 W., Mount Diablo base and meridian; flows in general westward, and enters the Pacific at Whitesboro; length, about 8 miles. Punnett's map of Mendocino County.

Salmon Creek; Sonoma County; rises in the northwestern part of T. 6 N., R. 9 W., Mount Diablo base and meridian; takes a general westerly course to the point at which it enters the Pacific near Johnsons Port; length, about 10 miles; principal tributaries, Nolan, Fay, and Colemans creeks. Punnett's map of Sonoma County.

Salmon River; Siskiyou County; rises in the southern part of T. 39 N., R. 9 W., Mount Diablo base and meridian; flows northwestward, westward, and southwestward to the southern part of T. 38 N., R. 11 W., whence its general course is northwestward to its junction with Klamath River (tributary to the Pacific) near Somesbar; length, including major windings, 46 miles; principal tributary, North Fork; other tributaries, Cecil, Crawford, Plummer, Matthews, Black Bear, Graham Gulch, Methodist, Niggerville Gulch, Knownothing, Horns, Crapo, Nordheumer, Moorehouse, Butler, Wolley, Oak Bottom, and Merrill creeks. Punnett's map of Siskiyou County. Gaging station near Somesbar (1911–12).

Salmon River, Little North Fork; Siskiyou County; rises in the central part of T. 40 N., R. 11 W., Mount Diablo base and meridian, on Tanner Peak, about half a mile west of the head of the North Fork; flows west of north 3 miles, westward 2 miles, then southward 5 miles to its junction with North Fork of Salmon (tributary through Salmon River to Klamath River, which discharges to the Pacific); the distance between the source and mouth of this fork is but little more than 3 miles; following the windings of the stream the distance is about 11 miles. Punnett's map of Siskiyou County.

Salmon River, North Fork; Siskiyou County; rises in the northern part of T. 40 N., R. 11 W., Mount Diablo base and meridian, on Tanner Peak; flows in general somewhat west of north 9 miles, then turns abruptly to the east, southeast, and west of south to the southeastern part of T. 40 N., R. 11 W., where its

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general course becomes northwestward for 7 miles. In the western part of T. 40 N., R. 12 W., it turns again to the southwest and continues to flow in this direction to Forks of Salmon where it unites with the Salmon (tributary to Klamath River, which flows to the Pacific); length, including major windings, about 40 miles, although the distance between the source of the river and its mouth, measured in a straight line, is only about 13 miles; the principal tributaries of this fork are Russian, White Gulch, Eddys and Jackson creeks, and Little North Fork of Salmon. Punnett's map of Siskiyou County.

Salmon River, South Fork. *See* Salmon River.

Salsipuedes Creek; Santa Barbara County; rises on the north slope of Santa Ynez Mountains, in San Julian Rancho, at altitude 500 feet above sea level; flows west of north 7 miles into Santa Ynez River (tributary to the Pacific); fall, about 400 feet; principal tributary, El Jaro Creek. Lompoc sheet.

Salt Canyon Creek; Los Angeles and Ventura counties; rises in Los Angeles County, in the northeastern part of T. 3 N., R. 17 W., San Bernardino base and meridian, on the north slope of the Santa Susana Mountains and flows northwestward into Santa Clara River (tributary to the Pacific); length, about 5½ miles; intermittent. Santa Susana sheet.

Salt Creek; Eel River basin; Trinity County; rises in the eastern part of T. 5 S., R. 7 E., Humboldt base and meridian; takes a general northerly course to its junction with North Fork Eel River (tributary to Eel River, which flows to the Pacific); length, 8 miles. Punnett's map of Trinity County.

Salt Creek; Klamath River basin; Trinity County; rises in the northern part of T. 29 N., R. 11 W., Mount Diablo base and meridian; takes a general northwesterly course to its junction with Hayfork River (tributary through South Fork of Trinity River to Trinity River and thus to Klamath River, which discharges to the Pacific); length, 14 miles. Punnett's map of Trinity County.

Salt Creek; Pajaro River basin; San Benito County; rises in the northern part of T. 16 S., R. 8 E., Mount Diablo base and meridian; flows west of north 6 miles into Rosario Creek, through which it is tributary to San Benito River (Pajaro River, tributary to the Pacific in Monterey Bay); length, about 7 miles. Land Office map of California, 1907.

Salt Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, 5 miles long, rising in the northwestern part of T. 7 N., R. 17 W., San Bernardino base and meridian, and flowing east of south into Castac Creek (tributary to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Salt Marsh Canyon Creek; Ventura County; an intermittent stream, 2 miles long rising on the south slope of Sulphur Mountain, in Ex Mission San Buenaventura Rancho and flowing southeastward into Adams Canyon Creek (tributary to Santa Clara River, which discharges to the Pacific). Santa Paula sheet.

Salton Sea; Riverside and Imperial counties; about 160 miles southeast of Los Angeles, 90 miles northwest of Yuma, and 50 miles north of Calexico; longer diameter trends northwest and southeast.

During the high water of the summer of 1891 the Colorado River overflowed into Salton Sink to such an extent as to endanger the Southern Pacific Railroad tracks. In the summer of 1905, after a succession of winter and spring floods in Gila River, followed by an exceptionally heavy summer flow in the Colorado, the flood into the sink was repeated on a much larger scale. The old river channel occupied by Alamo River was transformed into a deep winding gorge and another channel, now called New River, was formed. Notwithstanding all attempts to control it, the Colorado continued to pour its waters through Alamo

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and New Rivers into Salton Sea until the early fall of 1906, when it was finally shut off by the Southern Pacific Co. The river broke through again on December 7 of the same year but was closed about two months later. Since that time the area of the sea has been gradually decreasing by evaporation.

This closure proved not to be permanent, and the railroad and United States Government engineers have since been endeavoring to prevent further access of the Colorado to Salton Sink. Accounts of these operations have been published in the Transactions of the American Society of Civil Engineers, in the Engineering News, and in other engineering publications.

On December 31, 1908, the surface of the sea was 206 feet below mean sea level, its length was nearly 45 miles, its maximum width was 15 miles, minimum width, 9.5 miles, maximum depth, 67.5 feet, and superficial area about 443 square miles.

Practically all the water received by Salton Sea enters through Alamo and New rivers, but chiefly through the former. These rivers run through Imperial Valley and are the drainage channels for the excess and waste waters from irrigation systems.

Gaging station near Salton (1904–1912).

Authorities: Land Office map of California, 1907; Water-Supply Paper U. S. Geol. Survey No. 251, 1910, pp. 38–43. *See also* Mendenhall, W. C., Ground waters of the Indio region, California, with a sketch of the Colorado Desert: Water-Supply Paper No. 225, 1909.

Saltos Canyon Creek; San Luis Obispo County; an intermittent stream, 5 miles long, rising in the northeastern part of T. 32 S., R. 19 E., Mount Diablo base and meridian, and flowing southwestward to Carrizo Canyon, through which it is tributary to Cuyama River (Santa Maria River, which discharges to the Pacific). McKittrick sheet.

Salt Pond; Los Angeles County; just north of Redondo; separated from the Pacific by a sand bar. Redondo sheet.

Salt River; Humboldt County; one of the channels through which Eel River discharges to the Pacific; it leaves the main channel in the southern part of T. 3 N., R. 1 W., Humboldt base and meridian, winds westward, and rejoins the river at its mouth. Punnett's map of Humboldt County.

Salt Valley Creek; San Mateo County; an intermittent stream, about 1½ miles long, rising on the north slope of Sweeney Ridge in San Pedro Rancho and flowing westward toward Laguna Salada, a brackish-water lagoon separated from the Pacific by a narrow sand bar. San Mateo sheet.

Salt Well Dry Lake; San Bernardino County; just west of south end of Searles Lake, in T. 26 S., Rs. 41 and 42 E., Mount Diablo base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Samuel Creek; Santa Cruz County; rises in the northeastern part of T. 10 S., R. 1 E., Mount Diablo base and meridian; flows southwestward, and enters the Pacific in Monterey Bay, a short distance northeast of Samuel Point; length, about 15 miles. Land Office map of California, 1907.

San Andreas Lake; San Mateo County; a long, narrow lake, 2½ miles by one-quarter mile, lying in structural depression west of the Buriburi Ridge and east of Sweeney and Sawyer ridges; shown on the map (San Mateo sheet) without outlet, but a drainage channel extends southeastward from the lake to Crystal Springs Lake; altitude, 445 feet. San Mateo sheet.

San Antonio Creek; Alameda Creek basin; Alameda County; rises in the northwestern part of T. 5 S., R. 3 E., Mount Diablo base and meridian, at altitude 3,100 feet above sea level; flows northwestward 6 miles through Williams Gulch, then irregularly westward 7 miles through La Costa Valley to Sunol

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Valley, where it joins Alameda Creek (tributary to San Francisco Bay); fall, 2,850 feet; principal tributaries, La Costa, Indian, and Apperson creeks. Tesla and Pleasanton sheets.

San Antonio Creek; Alameda Creek basin; Santa Clara County; rises in the southwestern part of T. 7 S., R. 5 E., Mount Diablo base and meridian; flows in general northwestward to the southwestern part of T. 6 S., R. 4 E., where it unites with Arroyo Bayo to form Arroyo del Valle; length, about 11 miles. Mount Hamilton sheet; on the Land Office map of California, 1907, the name San Antonio Creek is applied to a stream joining the North Fork of Bayo Creek in the southeast part of T. 5 S., R. 3 E.

San Antonio Creek; Alascadero Creek drainage basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 2,500 feet above sea level; flows southward and southwestward into Maria Ygnacio Creek, through which it is tributary to Alascadero Creek, which discharges to the Pacific; length, about 6 miles; fall, 2,450 feet; principal tributary, Arroyo Burro Creek. Goleta special map.

San Antonio Creek; Santa Ana River basin; San Bernardino and Los Angeles counties; rises in northwestern part of T. 2 N., R. 7 W., San Bernardino base and meridian, on the south slope of San Antonio Peak, at altitude 8,650 feet above sea level; takes a general southwesterly course to San Bernardino Valley. Except Lytle Creek, which lies back of the entire ridge, San Antonio is the most important of the drainage ways from the Cucamonga Mountains. Its basin comprises about 25 square miles and is surrounded on three sides by high mountain ridges. The upper portions of its canyons are of very steep grade, but the grades of the lower portions are moderate. This creek has built up a large débris mass at the mouth of its canyon. Its waters, except in years of considerable flood, seldom run more than 6 to 8 miles down its wash into the plains, but a continuous channel of considerable dimensions extends across the plain a distance of 15 miles and joins Santa Ana River (tributary to the Pacific) near the head of its lower canyon, and in years of high flood the creek occupies this channel in large volume.

Authorities: San Antonio and Cucamonga sheets; Hall, Wm. Ham: Irrigation in California [southern]: Report of State Engineer of California, pt. 2, Sacramento, 1888, p. 125.

San Antonio Creek; Santa Barbara County; drains the area lying north of the Santa Ynez basin and south of the Santa Maria basin, between the Purisima and Solomon Hills, including Los Alamos and San Antonio Valleys; enters the Pacific 3 miles northeast of Purisima Point; called Arroyo de los Alamos above Los Alamos Valley; the area is very narrow and the tributary canyons are all short. Lompoc and Guadalupe sheets.

San Antonio Creek; Santa Clara County; rises in the northeastern part of T. 7 S., R. 3 W., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows in general north of west to the tidal marsh at the southern end of San Francisco Bay. Santa Cruz and Palo Alto sheets.

San Antonio Creek; Ventura River basin; Ventura County; rises in the central part of T. 5 N., R. 22 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows southwestward across Ojai Valley, and discharges into Ventura River (tributary to the Pacific) near La Crosse Station; length, about 12 miles; fall, 2,300 feet; principal tributaries, Gridley, Horn, and Lion Canyon creeks; upper course lies through Senor Canyon. Santa Paula and Ventura sheets.

San Antonio River; Salinas River basin; Monterey County; rises in the northwestern part of T. 21 S., R. 5 E., Mount Diablo base and meridian, in Monterey National Forest; flows southeastward about 40 miles in a course

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parallel to but directly opposite that of Salinas River, then turns abruptly and flows northeastward 6 miles into the Salinas, which discharges to the Pacific in Monterey Bay; principal tributaries, Bear and Mission creeks. Gaging station near Jolon (1900–1901). Land Office map of California, 1907.

San Benito River. *See* Pajaro River.

San Bernardo Creek; Chorro Creek basin; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains in the western part of T. 29 S., R. 12 E., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows southwestward 5½ miles into Chorro Creek, which discharges to the Pacific through Morro Bay; fall, about 1,200 feet. San Luis Obispo and Cayucos sheets.

San Bruno Creek; San Mateo County; rises on the eastern slope of Buriburi Ridge, at altitude 700 feet above sea level; flows easterly toward San Francisco Bay, south of San Bruno Point; intermittent. San Mateo sheet.

San Carvoforo Creek; Monterey and San Luis Obispo counties; rises in the central part of T. 24 S., R. 7 E., Mount Diablo base and meridian, in the southeastern part of Monterey National Forest; flows southwestward into the Pacific at Ragged Point; principal tributary, South Fork. Land Office map of California, 1907.

San Carvoforo Creek, South Fork; San Luis Obispo County; rises in the northeastern part of T. 25 S., R. 7 E., Mount Diablo base and meridian; flows westerly into San Carvoforo Creek, which discharges to the Pacific. Land Office map of California, 1907.

San Clemente Canyon Creek; San Diego County; rises in southeastern part of T. 15 S., R. 2 W., San Bernardino base and meridian, at altitude 900 feet above sea level; flows southwestward 7½ miles, then somewhat south of west 6 miles into Rose Canyon Creek, which discharges to the Pacific through False Bay; intermittent; fall, 800 feet. La Jolla sheet.

San Clemente Creek; Carmelo River basin; Monterey County; rises in the southeastern part of T. 17 S., R. 1 E., Mount Diablo base and meridian; flows north of east into Glicko Creek (tributary to Carmelo River, which discharges to the Pacific in Carmelo Bay); length, about 8 miles. Land Office map of California, 1907.

Sand Canyon Creek; Los Angeles County; rises in the central part of T. 3 N., R. 14 W., San Bernardino base and meridian; flows southwestward 2 miles, then northwestward to its junction with Santa Clara River (tributary to the Pacific); length, about 8 miles; fall in the 3½ miles above the mouth of the canyon, 1,250 feet; principal tributaries, Iron Canyon, Bear Canyon, Coyote Canyon, German Canyon, and Placerita Canyon creeks; Sand Canyon delivers water to the Santa Clara River and receives water from its tributary canyons only in times of flood. Fernando sheet.

Sand Creek; San Diego River basin; San Diego County; rises in west-central part of T. 14 S., R. 3 E., San Bernardino base and meridian, at altitude 2,800 feet above sea level; flows southwestward 3 miles, then northwestward 3 miles into San Diego River (which discharges to the Pacific through False Bay); intermittent; fall, 2,000 feet. Cuyamaca sheet.

Sand Creek; Santa Ana River basin; San Bernardino County; rises in the northwestern part of T. 1 N., R. 3 W., San Bernardino base and meridian, at altitude 3,750 feet above sea level; flows southwestward to San Bernardino Valley; flood waters pass to Santa Ana River (tributary to the Pacific) through Warm Creek; fall above the edge of the valley, 2,250 feet in about 3 miles. Redlands sheet.

Sand Creek, Little; Santa Ana River basin; San Bernardino County; rises in the northwestern part of T. 1 N., R. 3 W., San Bernardino base and meridian,

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at altitude 3,500 feet above sea level; flows southwestward to San Bernardino Valley, about three-fourths mile northwest of the opening of the canyon of Sand Creek; flood waters may reach the Santa Ana (tributary to the Pacific) through Warm Creek; fall in the 2½ miles above the valley, 2,000 feet. Redlands sheet.

Sandia Canyon Creek; Riverside and San Diego counties; rises about 3 miles south of Murietta, at altitude 1,500 feet above sea level; flows southwestward and southward to its junction with Santa Margarita River (tributary to the Pacific) in the northeastern part of T. 9 S., R. 4 W., San Bernardino base and meridian; length, about 10 miles. Elsinore and San Luis Rey sheets.

Sandiego Creek; Salinas River basin; Kern County; an intermittent stream rising on the west slope of the Temblor Range in T. 30 S., R. 20 E., Mount Diablo base and meridian, and flowing southwestward to Carrizo Plain; this plain is drained northwestward by San Juan Creek to Estrella Creek, a branch of Salinas River, which discharges to the Pacific in Monterey Bay. McKittrick sheet.

San Diego River; San Diego County; rises in Cuyamaca Mountains, on the west slope of the Coast Range, at altitude about 5,000 feet above sea level; flows southwestward and discharges into the Pacific through False Bay at the north boundary of San Diego city; length, about 50 miles, half of which lies in the mountains above the town of Lakeside.

The basin lies directly south of the Santa Ysabel and north of Sweetwater River basin. It is fan-shaped as compared with the narrower basin of the Sweetwater, and includes a much greater area of high mountain territory. Its various tributaries plunge down rocky canyons and unite in one channel of much lower grade at an altitude of about 900 feet above sea level. Below El Cajon Valley the river is confined to a narrow rocky channel for about 2½ miles. For nearly 40 miles above its mouth the river occupies a broad sandy bed with low banks and with grades from 20 to 35 feet per mile. The most important tributaries are Coleman, Cedar, Boulder, South Fork, and Chocolate creeks, all of which enter from the east and south above Lakeside. San Vicente Creek, the only important tributary from the north, enters the river at Lakeside.

The upper part of the basin, above Lakeside, is extremely rough and rugged, but below Lakeside are numerous valleys and high mesa lands that extend to the coast. Elevations throughout the basin range from 50 to 600 feet in the foothills and from 600 to 6,000 feet in the mountains. Cuyamaca Peak, the highest point in the basin, is 6,515 feet above sea level.

The San Diego basin is very poorly forested. The timber is confined almost entirely to the valley along the streams and to the higher mountain areas. The mountain slopes are fairly well covered with brush, but the lower foothills are almost entirely bare, having only a scattering growth of low brush.

The mean annual rainfall ranges from 10 to 15 inches along the foothill belt, and from 20 to 40 inches in the mountains.

Irrigation is carried on extensively in the valleys and on the mesa lands between Lakeside and San Diego.

Gaging station near Lakeside (1905–1912).

Authorities.—Ramona, Cuyamaca, Elcajon, and La Jolla sheets; Water Supply Paper U. S. Geol. Survey No. 291, 1912, p. 31; Irrigation in California [southern]; by Wm. Ham. Hall, Sacramento, 1888, pp. 41–43.

San Diego River, South Fork; San Diego County; rises in the west-central part of T. 14 S., R. 3 E., San Bernardino base and meridian, at altitude 2,700 feet above sea level; flows southwestward into San Diego River, which discharges into the Pacific through False Bay; intermittent; length, about 8 miles;

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fall, 2,100 feet; principal tributaries, Conejos and King creeks. Cuyamaca sheet.

San Dieguito River; San Diego County; rises in Volcan Mountains at altitudes exceeding 5,000 feet above sea level; flows westward and southwestward and enters the Pacific about 20 miles north of the mouth of San Diego River in False Bay. The stream is known as the San Dieguito at its mouth, is called the Bernardo upstream, the San Pasqual still farther up, and the Santa Ysabel near its source. "This custom of calling a stream by different names along succeeding portions of its route was derived from the Mexicans (who named the streets of their towns also after the same fashion), is a confusing one, and has led to misunderstanding regarding the identity of this river,"[1]

The San Dieguito is about 50 miles long and drains an area comprising approximately 340 square miles lying south of the basin of San Luis Rey River and north of the San Diego basin.

Between its source and San Pasqual Valley Santa Ysabel Creek receives many small tributaries, the most important being Black Canyon and Temescal creeks from the north and Santa Maria Creek from the south. Above San Pasqual Valley the creek maintains a light flow throughout the year, but below that point the channel is dry during the summer months.

The upper part of the basin is rough, the surface being cut by many canyons. The foothill region is more rolling and includes large areas of valley and high mesa land. The basin has very little timber, the principal cover being brush, grass, and a few scattered oaks.

The mean annual rainfall ranges from 10 to 15 inches along the foothills and 20 to 40 inches in the mountains.

A good storage reservoir site exists on the main stream at Pamo Valley below the junction of Temescal Creek with the Santa Ysabel. The dam site is about 4 miles above the gaging station which has been maintained on the Santa Ysabel near Escondido since December, 1905.

Gaging stations near Escondido (1905–1912), near Ramona (1912), and at Bernardo (1911–12).

Authorities.—Ramona, Escondido, and La Jolla sheets; Water-Supply Paper U. S. Geol. Survey No. 271, p. 95; No. 291, 1912, pp. 36–37.

Sandy Creek; San Diego County; rises in the southwestern part of T. 13 S., R. 4 E., San Bernardino base and meridian, at altitude 4,800 feet above sea level; flows westward 3 miles into Cedar Creek (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; fall, 1,400 feet. Ramona sheet.

San Dimas Canyon Creek; Los Angeles County; rises in the southern part of T. 2 N., R. 8 W., San Bernardino base and meridian, at altitude 4,250 feet above sea level; flows in general southwestward to the valley of San Gabriel River (tributary to the Pacific). The basin is about 7½ miles long, opens out in fan shape to a width of about 5 miles at the head, but is reduced to a narrow neck for 2 miles along the lower course of the stream, so that its area comprises but 17½ square miles. Entering the extreme eastern end of the valley, the San Dimas Wash runs a little south of west through the cultivable lands for perhaps 10 miles as a distinct belt of gravel and sand nearly one-quarter of a mile wide, and then in a measure is lost in the sandy plain that borders the river on the east about midway down the valley. Cucamonga and Pomona sheets; Hall, Wm. Ham., Irrigation in [southern] California: Report of State

[1] Hall, W. H., Irrigation in California [southern]: Report of the State Engineer of California on irrigation and the irrigation question, pt. 2, Sacramento, 1888, p. 48.

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Engineer of California on irrigation and the irrigation question, pt. 2, Sacramento, 1888, pp. 376–377.

San Dimas Canyon, East Fork; Los Angeles County; rises in the southern part of T. 2 N., R. 8 W., San Bernardino base and meridian, at altitude 5,400 feet above sea level; flows southwestward 3½ miles into San Dimas Canyon (tributary to San Gabriel River, which discharges to the Pacific); fall, 3,500 feet. Cucamonga and Pomona sheets.

San Dimas Canyon Creek, West Fork; Los Angeles County; San Gabriel River basin; rises in the southwestern part of T. 2 N., R. 8 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows southwestward about 3 miles, then southeastward 1½ miles into San Dimas Canyon (tributary to San Gabriel River, which discharges to the Pacific); fall, 1,600 feet. Pomona sheet.

San Elijo Creek. *See* Escondido Creek.

San Elijo Lagoon; San Diego County; 2 miles southeast of Encinitas; a brackish-water marsh into which Escondido Creek drains. The lagoon is separated from the ocean by a narrow sand ridge which at times may be cut through by flood waters of the creek. Escondido and Oceanside sheets.

San Felipe Creek; Coyote River basin; Santa Clara County; rises on the northwest slope of San Felipe Hills in Los Huecas Rancho, at altitude 2,700 feet above sea level; flows northwestward 3 miles, then turns abruptly and flows east of south to its junction with Coyote River (tributary to San Francisco Bay) in the northeastern part of T. 9 S., R. 3 E., Mount Diablo base and meridian. Mount Hamilton sheet; called Canada Verde Creek on the Land Office map of California, 1907.

San Felipe Creek; Salton Sink basin; San Diego and Imperial counties; an intermittent stream rising in the northern part of T. 12 S., R. 4 E., San Bernardino base and meridian, and flowing southeastward through San Felipe Valley into Salton Sink. Ramona sheet; Water-Supply Paper U. S. Geol. Survey No. 225, 1909, Pl. I.

San Francisquito Canyon Creek; Los Angeles County; rises in the southwestern part of T. 6 N., R. 15 W., San Bernardino base and meridian, on the southeast slope of Red Mountain, at altitude 3,050 feet above sea level; flows southwestward about 10 miles, then westerly to its junction with Santa Clara River (tributary to the Pacific) near Castac; length, about 12 miles; fall, 2,050 feet; intermittent. Tejon and Santa Susana sheets.

San Francisquito Creek; San Mateo County; rises in the southeastern part of Canada de Raymundo Rancho, 2 miles southeast of Sierra Morena; flows in general north of east into the tidal marsh at the south end of San Francisco Bay; passes through Searsville Lake; forms portion of boundary between San Mateo and Santa Clara counties; principal tributaries, Bear and Los Trancos creeks. Santa Cruz and Palo Alto sheets.

San Gabriel River; Los Angeles County; formed in the southwestern part of T. 3 N., R. 8 W., San Bernardino base and meridian, by the union of Prairie and Fish forks. Prairie Fork, which drains the larger area and may therefore be considered the continuation of the main stream, rises on the west slope of Pine Mountain, at altitude 8,750 feet above sea level; flows north of west 5 miles, then west of south 3 miles to its junction with Fish Fork (which drains the northern and western slopes of San Antonio Peak (Old Baldy); below these forks the general course of the river is southwestward to the Coastal Plain.

In past ages both the San Gabriel and the Los Angeles rivers wandered over the area now covered by the city of Los Angeles, as well as over the land

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between Los Angeles and the sea, their waters reaching the Pacific now in one place, now in another. When the white man first came to the region, Los Angeles River, augmented by the San Gabriel, was occupying its present bed and discharging through the present mouth at Long Beach. In 1867 the San Gabriel changed its outlet to Alamitos Bay, a few miles to the east, but returned to Long Beach in 1910.[1]

Measured from the head of Prairie Fork to the coast, the length of the San Gabriel is about 65 miles; its total drainage area is approximately 700 square miles, about one-third of which consists of mountain slopes which contribute practically all the run-off except in heavy storms; the remaining two-thirds is embraced in the San Gabriel Valley at the base of the mountains and in the Coastal Plain southeast of the city of Los Angeles.

The principal tributaries below the mouth of Fish Fork are Iron Fork, Cattle Creek, West Fork (whose principal tributary is the North Fork) and San Jose Creek. Each of these forks receives many tributaries from the crests of the surrounding ranges.

After leaving the mountains the river traverses San Gabriel Valley in a wide wash of sand, gravel, and bowlders, then breaks through the range of foothills separating San Gabriel Valley from the Coastal Plain at a point called The Narrows, about 5 miles west of Whittier. Through the San Gabriel Valley the waters occupy at times of flood the various channels within the immense wash, in most places about half a mile wide but in one place fully 1½ miles wide; through the pass the channel loses the character of a steep, sloping wash and assumes that of a sandy, shifting, river-bed, several hundred feet wide, with low, alluvial banks, margined by bottom lands. On the Coastal Plain it retains this general character but without any bottom-land fringing until it approaches the ocean. After the subsidence of the spring freshets, sometimes in May but usually in June, the waters of the river sink into the gravels of its wash within 3 or 4 miles below the canyon's mouth, and thence for 6 miles during the irrigation season its bed is dry. Approaching the Coast Range the waters begin to rise again and for 3 miles farther, through the pass, they break forth in many places.

Gaging station near Azusa (1895–1912).

Authorities.—San Antonio, Rock Creek, Cucamonga, Pomona, Tujunga, Pasadena, and Downey sheets; Hall, W. H., Irrigation in southern California, Sacramento, 1888, pp. 373–376.

San Gabriel River, Fish Fork; Los Angeles County; rises on the north and west slopes of San Antonio Peak (altitude, 10,080 feet), at altitude 8,750 feet above sea level; flows north of west 4½ miles, then southwest 1 mile into San Gabriel River (tributary to the Pacific); fall, 5,450 feet. San Antonio sheet.

San Gabriel River, Iron Fork; Los Angeles County; rises in the northeastern part of T. 3 N., R. 9 W., San Bernardino base and meridian, on the west slope of North Baldy, at altitude 8,750 feet above sea level; flows in general southeasterly to its junction with San Gabriel River (tributary to the Pacific) 1 mile above The Narrows; fall, about 6,000 feet; principal tributary, South Fork. Rock Creek and San Antonio sheets.

San Gabriel River, Iron Fork, South Fork of; Los Angeles County; rises in the central part of T. 3 N., R. 9 W., San Bernardino base and meridian, in the mountainous region south of Mount Islip, at altitude 7,750 feet above sea

[1] Abstracted from Report on Los Angeles Harbor, by Capt. Amos A. Fries; reprint from Professional Memoirs Corps of Engineers, Jan.–Feb. 1912, p. 6.

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level; flows southeastward 4 miles to its junction with Iron Fork (tributary to San Gabriel River, which discharges to the Pacific); fall, 4,000 feet. Rock Creek sheet.

San Gabriel River, North Fork; Los Angeles County; rises in the central part of T. 3 N., R. 9 W., San Bernardino base and meridian, 1½ miles southeast of Mount Islip, at altitude 7,000 feet above sea level; flows west of south to its junction with West Fork of San Gabriel River (tributary to San Gabriel River, which discharges to the Pacific); length, 8 miles; fall, 5,450 feet. Rock Creek and Pomona sheets.

San Gabriel River, Trail Fork; Los Angeles County; rises in the northwestern part of T. 2 N., R. 11 W., San Bernardino base and meridian, at altitude 4,250 feet above sea level; flows west of south 1½ miles into the West Fork of San Gabriel River (tributary to San Gabriel River, which discharges to the Pacific); fall, 1,100 feet. Tujunga and Pasadena sheets.

San Gabriel River, West Fork; Los Angeles County; rises in the eastern part of T. 2 N., R. 12 W., San Bernardino base and meridian, 1 mile northwest of San Gabriel Peak, at altitude 5,250 feet above sea level; flows eastward to its junction with San Gabriel River (tributary to the Pacific) in the southwestern part of T. 2 N., R. 9 W.; length, 16 miles; fall, 3,950 feet; principal tributaries, Devils Canyon, Chileno Canyon, and Bear creeks, and North Fork San Gabriel River, all of which enter from the north; receives within 3 miles of its head a short stream from the south draining the north slope of Mount Wilson. Tujunga, Pasadena, Rock Creek, and Pomona sheets.

San Gorgonio Creek, Little; San Bernardino and Riverside counties; Santa Ana River basin; rises in the southeastern part of T. 1 S., R. 1 W., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southwestward into San Timoteo Creek; length, 10 miles; fall, 2,300 feet; principal tributary, Noble Creek. San Gorgonio, San Jacinto, and Elsinore sheets.

San Gorgonio River; San Bernardino and Riverside counties; rises in the mountainous region south of San Gorgonio Mountain, in T. 1 S., R. 1 E., San Bernardino base and meridian, at altitude about 9,000 feet above sea level; flows southwestward 6 miles, then turns to the south and southeast and discharges into the western end of San Gorgonio Pass, which slopes eastward from a point near Beaumont to the Colorado Desert. The fall in the 12 miles above the pass is 6,500 feet. San Gorgonio and San Jacinto sheets.

San Gregorio Creek; San Mateo County; formed in the southwestern part of T. 7 S., R. 4 W., Mount Diablo base and meridian, by the junction of Alpine and Mindego creeks; flows north of west about 8 miles and enters the Pacific in San Gregorio Rancho, 1 mile west of the town of San Gregorio; drainage area, 52 square miles; principal tributaries below the mouth of Alpine Creek, La Hondo, Harrington and El Cortè de Madera creeks. Santa Cruz sheet; Santa Cruz folio No. 163, Geol. Atlas U. S., U. S. Geol. Survey, p. 1.

Sanhedrin Creek; Mendocino County; rises in the northeastern part of T. 19 N., R. 12 W., Mount Diablo base and meridian; flows southwestward into Eel River (tributary to the Pacific); length, 4 miles. Punnett's map of Mendocino County.

San Jacinto Creek; Monterey and San Luis Obispo counties; rises in the southeastern part of T. 23 S., R. 13 E., Mount Diablo base and meridian; flows southwestward into Estrella Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 14 miles. Land Office map of California, 1907.

San Jacinto River; Riverside County; formed in the western part of T. 5 S., R. 2 E., San Bernardino base and meridian, by the junction of its North and South forks. The South Fork, which drains the larger area and is therefore

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considered the continuation of the main stream, rises in the central part of T. 6 S., R. 4 E., at altitude about 6,500 feet above sea level; flows southward about 3 miles through Bull Canyon, then northwestward 18 miles to its point of junction with the North Fork. Below the forks the river continues a northwesterly course about 20 miles, then turns abruptly and flows southwestward to Elsinore Lake, an inclosed body of brackish water. An old channel connects Elsinore Lake with the Temescal Wash, which discharges into Santa Ana River below Corona.

The river itself is a stream of peculiar regimen and irregular course. Its headwaters, rising on the slopes of the San Jacinto Mountains, plunge through deep canyons to their junction with the main stream on the plain 5 or 6 miles above San Jacinto. These upper tributaries are perennial streams, but so much of the water as is not diverted for irrigation at the mouth of the canyon sinks during dry seasons in the sands of the river channel above Florida Vallevista. During the winter period the stream as a rule contains flowing water as far as Mystic Lake, in the flats east of Lakeview.

The exceptional storms of winter, particularly the rainfall, fill this lake to overflowing, convert its banks into a marsh, and spill the waters out through the tortuous but slough-like channel west of Lakeview, across the Perris Plains, enter the head of Railroad Canyon, and continue through the gorge to Elsinore Lake. Once or twice since the valley has been occupied by white men floods in the San Jacinto River have raised the level of Elsinore Lake to such a point that it has overflowed into Temescal Wash, so that during these exceptional times the San Jacinto has been a continuous stream from its source to its junction with Santa Ana River through which it discharged to the sea; under all ordinary conditions, however, the stream is discontinuous and its waters never join those of the ocean.

The drainage basin comprises an irregular area about 65 miles in extreme length, east and west, and approximately 30 miles in greatest width in a northeast-southwest direction. From the mouth of San Jacinto Canyon to the base of the Box Springs Mountains the floor of the valley is a remarkably level lowland, standing 1,500 to 1,600 feet above sea level; in relation to the adjacent lowlands of Santa Ana Valley to the north and northwest, this valley has the characteristics of a plateau, for it stands 500 to 1,000 feet above them. Considered alone, however, it is distinctly a basin, for it is inclosed on all sides by an irregular mountain rim.[1]

Altitudes within the basin range from 1,220 feet at Lake Elsinore to 10,805 feet at the summit of San Jacinto Peak; Santiago Peak, west of Lake Elsinore is 5,680 feet; principal tributaries of the San Jacinto are Strawberry Creek, North Fork, and Bautista Creek. San Jacinto and Elsinore sheets.

San Jacinto River, North Fork; Riverside County; rises in the western part of T. 4 S., R. 3 E., San Bernardino base and meridian, on the west slope of San Jacinto Peak, at altitude 9,700 feet above sea level; flows in general southwestward to its junction with the South Fork of San Jacinto 5 miles southeast of Florida Vallevista; length, 10 miles; fall, 7,500 feet. San Jacinto sheet.

Sanjen de los Alisos; Alameda County; one of the channels through which Alameda Creek discharges to San Francisco Bay; Alameda Creek divides 1 mile north of Centervale, but part of its water flows northward and westward directly to the bay, the other part flows southwestward through Sanjen de los Alisos to Beard Creek, in the tidal marsh at the south end of the bay. Haywards sheet.

[1] The foregoing description has been abstracted from a manuscript report on the San Jacinto basin, by W. C. Mendenhall.

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San Jose Creek; Monterey County; rises in the central part of T. 17 S., R. 1 E., Mount Diablo base and meridian; flows northwestward and enters the Pacific in Carmelo Bay, east of Point Carmelo; length, about 7 miles. Land Office map of California, 1907, on which it is shown but not named; Post Route map, 1911.

San Jose Creek; San Gabriel River basin; Los Angeles County; rises around the eastern end of San Jose Hills above Pomona, turns the point of the range, and flows south and west between it and the Coast Range foothills, enters San Gabriel Valley at its extreme southeastern corner, and joins San Gabriel River (tributary to the Pacific) in the Paso de Bartolo Rancho; the stream has no high mountain drainage area of its own; about 9 square miles of the San Jose Hills slope to its valley from the north, and about 25 square miles of the Coast Range, in a long, very narrow strip, slope to it from the south; its principal source of water seems to be the great gravel bed at its head which constitutes the artesian belt of Pomona. The waters of the stream rise at a number of points along its course. Pomona and Pasadena sheets; Hall, W. H., Irrigation in California [southern], Sacramento, 1888, p. 380.

San Jose Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains near Brush Peak; flows eastward through Deadman Canyon, then south of west to La Goleta Rancho where its waters sink before reaching the tidal marsh which carries the drainage of this area into the Pacific; length to head of Deadman Canyon, about 10 miles. Goleta special sheet.

San Juan Creek; Salinas River basin; San Luis Obispo County; rises in the northwestern part of T. 32 S., R. 19 E., Mount Diablo base and meridian, in the San Luis Obispo National Forest; flows northwestward along the west margin of the Carriso Plain to Shandon, where it unites with Cholame Creek to form Estrella Creek (tributary to Salinas River, which discharges to the Pacific in Monterey Bay); length, about 40 miles; tributaries are all short and none of them are named on the map. Land Office map of California, 1907.

San Juan Creek; Riverside and Orange counties; formed in the southwestern part of T. 6 S., R. 5 W., San Bernardino base and meridian, by the junction of streams rising on the western slope of Elsinore Mountains and flowing through Long, Decker, and Morrill canyons; flows in general southwesterly to the lagoon near San Juan, 3 miles southwest of Capistrano. The lagoon is separated from the Pacific by a narrow sand bar. Below the upper canyons the creek receives intermittent streams draining Hot Spring, Cold Spring, Lucas, Verdugo, Bell, Gubernadora, and Chiquito canyons and Arroyo Trabuco. Elsinore, Corona and Capistrano sheets.

San Leandro Creek; Contra Costa and Alameda counties; rises in the central part of T. 1 S., R. 3 W., Mount Diablo base and meridian, on the south slope of Round Top, at altitude 1,200 feet above sea level; flows southeastward 11 miles to the east end of Lake Chabot, then westward through the lake and discharges through San Leandro Bay to San Francisco Bay; length, about 20 miles; principal tributaries, West Branch, Redwood, Kaiser, and Miller creeks. Concord and Haywards sheets.

San Leandro Creek, West Branch; Contra Costa and Alameda counties; rises in Laguna de los Palos Colorados Rancho, on the southern slope of Mulholland Hill, at altitude 800 feet; takes a general southerly course to its junction with San Leandro Creek, which discharges through San Leandro Bay to San Francisco Bay; length, 3½ miles; fall, about 400 feet. Concord sheet.

San Lorenzo Creek; Alameda County; formed in Castro Valley, in San Lorenzo Rancho, by the union of Palomeras and Cull creeks (q. v.); flows in general westward to a point east of Roberts Landing, where its waters sink

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before reaching the tidal marsh on the east side of San Francisco Bay; length, from the valley to the marsh, about 6 miles, in which distance the fall is 200 feet. Haywards sheet.

San Lorenzo Creek; Salinas River basin; Monterey County; rises in the northern part of T. 21 S., R. 12 E., Mount Diablo base and meridian; flows northwestward about 24 miles, then westward and southwestward to King City, where it joins Salinas River (tributary to the Pacific in Monterey Bay); principal tributary, Bitterwater Creek. Gaging station near King City (1900–1903, 1912). Land Office map of California, 1907.

San Lorenzo River; Santa Cruz County; rises in the western part of T. 8 S., R. 2 W., Mount Diablo base and meridian, on the west slope of Castle Rock Ridge, at altitude 1,400 feet above sea level; flows east of south to the city of Santa Cruz where it enters the Pacific; length, about 22 miles; principal tributaries, Kings, Bear, Boulder, Newell, Fall, and Zayante creeks. Santa Cruz sheet.

San Lucas Creek; Santa Ynez River basin; Santa Barbara County; an intermittent stream, 3 miles long, rising on the north slope of the Santa Ynez Mountains and flowing west of north to Santa Ynez River (tributary to the Pacific) 3 miles southeast of Santa Ynez. Lompoc sheet.

San Luis Rey River; San Diego County; rises in the southern part of T. 9 S., R. 3 E., San Bernardino base and meridian, at altitude about 3,700 feet above sea level; flows southwestward about 10 miles, northwestward 22 miles, then again to the southwestward for 22 miles to Oceanside, where it enters the Pacific. Its drainage area comprises about 575 square miles extending from the crest of the Coast Range to the Pacific, a distance of 65 miles with a maximum width of about 16 miles.

The river is formed by many small streams which rise in the higher parts of the Coast Range and come together at the lower—the west—end of what is known as Warners Valley. Below this point the river flows for a distance of 10 miles through a deep narrow canyon with heavy grade, then over a sandy, gravelly bed with light grade for some 40 miles.

For 23 miles above its mouth the river occupies an open valley in places over a mile wide. Above Pala it is bordered for several miles on the north and east by a high plateau which breaks off abruptly with steep banks 100 feet or more high. Through this plateau several living streams cut their way to the river. Altitudes in the basin range from 50 to 500 feet in the foothills in the vicinity of Oceanside, and from 500 to 6,000 feet in the mountains. The upper portion of the basin is more or less rolling and several of the valleys are under cultivation and are used for stock raising. The middle part, occupied by the river in its canyon, is rough. On the lower reaches the surface becomes less rugged, merging into the foothills which extend to the coast.

The basin is poorly forested. Some fairly good timber is found on the higher elevations, but the greater part of the cover is brush and grass with a scattered growth of oaks.

Mean annual precipitation probably ranges from 10 to 40 inches, gradually increasing with altitude. It appears almost entirely as rain, snow falling only occasionally on the higher parts of the basin.

Gaging stations at diversion flume (1894–1899), near Mesa Grande (1911–12), near Pala (1903–1912), and at Bonsall (1912).

Authorities.—Ramona and San Luis Rey sheets; Water Supply Paper U. S. Geol. Survey No. 291, 1910, p. 39.

San Luis Rey River, West Fork; San Diego County; rises in the southern part of T. 9 S., R. 1 E., San Bernardino base and meridian, at altitude 5,300 feet above sea level; flows southeastward 12 miles to its junction with San Luis

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Rey River (tributary to the Pacific) in San Jose del Valle; fall, 2,600 feet; intermittent. Mendenhall, Barker, and Pine valleys are in the area drained by this branch of the San Luis Rey. Ramona sheet.

San Luisito Creek; Chorro Creek basin; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains in T. 29 S., R. 12 E., Mount Diablo base and meridian, at altitude 1,250 feet above sea level; flows southwestward into Chorro Creek, which discharges to the Pacific through Morro Bay; length, 4½ miles; fall, 1,150 feet. San Luis Obispo and Cayucos sheets.

San Luis Obispo Creek; San Luis Obispo County; rises on the western slope of the Santa Lucia Mountains, south of Cuesta Pass, at altitude 1,570 feet above sea level; takes a general southwesterly course to San Luis Obispo Bay, through which it enters the Pacific; passes through the city of San Luis Obispo; length, about 15 miles; tributaries, Reservoir Canyon, Davenport, and See Canyon creeks. San Luis Obispo and Arroyo Grande sheets.

San Marcos Creek; Salinas River basin; San Luis Obispo County; rises in the southeastern part of T. 26 S., R. 10 E., Mount Diablo base and meridian; flows northeastward into Salinas River (which discharges to the Pacific through Monterey Bay) south of San Miguel; length, about 12 miles. Land Office map of California, 1907.

San Marcos Creek; San Diego County; rises in the west central part of T. 11 S., R. 2 W., San Bernardino base and meridian, on the east slope of Merriam Mountains, at altitude, 1,800 feet above sea level; flows southwestward and discharges into Batiquitos Lagoon, a brackish-water marsh, 3 miles north of Encinitas. The marsh is separated from the Pacific by a narrow sand ridge which may at times be cut through by the flood waters of the creek; length to the head of the lagoon, about 15 miles; intermittent. Escondido and Oceanside sheets.

San Martinez Grande Canyon Creek; Ventura and Los Angeles counties; rises in Ventura County in the western part of T. 4 N., R. 17 W., flows eastward and southward to Santa Clara River (tributary to the Pacific); length, about 3 miles; intermittent. Santa Susana sheet.

San Martinez Chiquito Canyon Creek; Los Angeles County; rises in the northwestern part of T. 4 N., R. 17 W., in Santa Barbara National Forest; flows southeastward and southward into Santa Clara River (tributary to the Pacific) near Delvalle; intermittent. Santa Susana sheet.

San Mateo Creek; Riverside and San Diego counties; rises in the southeastern part of T. 6 S., R. 5 W., west of the Elsinore Mountains, at altitude 2,800 feet above sea level; flows southward and southwestward through San Mateo Canyon, and enters the Pacific at San Mateo Point; length, about 23 miles; principal tributaries, streams draining Wildhorse, Los Alamos, Tenaja, Devil, and Cristianitos canyons; intermittent. Elsinore, San Luis Rey, and Capistrano sheets.

San Mateo Creek; San Mateo County; rises in San Pedro Rancho, on the west slope of Sweeney Ridge, at altitude 1,100 feet above sea level; flows southeastward 5½ miles to Crystal Lake, from which it emerges on the east shore and winds northeastward to San Francisco Bay east of the city of San Mateo. San Mateo sheet.

San Miguelito Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising on the north slope of the Lompoc Hills and flowing northeastward to Lompoc, where its waters sink before reaching the channel of Santa Ynez River (tributary to the Pacific). Lompoc sheet.

San Pablo Creek; Contra Costa County; rises in Laguna de los Palos Colorados Rancho, on the north slope of Mulholland Hill, at altitude 900 feet above sea level; flows in general northwestward to the tidal marsh through which

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it passes to San Pablo and San Francisco bays; length, about 16 miles; principal tributaries, West Branch, Lauterwasser, Bear, and Wild Cat creeks. Concord and San Francisco sheets.

San Pablo Creek, West Branch; Contra Costa County; rises in the northwestern part of T. 1 S., R. 3 W., Mount Diablo base and meridian, at altitude 1,400 feet above sea level; flows northwestward 1½ miles, then northeastward 1½ miles to its junction with San Pablo Creek (tributary to San Pablo Bay) near Bryant Station; fall, about 950 feet. Concord sheet.

San Pedro Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains at altitude 1,250 feet above sea level; flows southwesterly and southerly to a point southwest of La Patera, where its waters sink before reaching the tidal marsh through which this part of Santa Barbara County is drained to the Pacific; length, about 5 miles. Goleta special sheet.

San Pedro Creek; San Mateo County; rises in the western part of T. 4 S., R. 5 W., Mount Diablo base and meridian, at altitude 1,300 feet above sea level; flows in general northwestward through San Pedro Valley, and enters the Pacific half a mile east of San Pedro Point; length, about 4 miles. San Mateo sheet.

San Rafael Creek; Marin County; rises in Santa Margarita y los Gallinas Rancho; flows southeastward through the city of San Rafael into San Francisco Bay. Tamalpais and San Francisco sheets.

San Ramon Creek. *See* Walnut Creek.

San Roque Creek; Santa Barbara County; rises in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains, at altitude 2,000 feet above sea level; flows irregularly southward to the point at which it enters the Pacific 3 miles west of Santa Barbara; tributary, Diablo Canyon Creek; intermittent. Santa Barbara and Goleta special sheets.

San Sevaine Canyon Creek; Santa Ana River basin; San Bernardino County; an intermittent stream, about 2 miles long, flowing southward into San Bernardino Valley, which it enters about 3 miles west of Lytle Creek. San Bernardino sheet.

San Simeon Creek; San Luis Obispo County; rises in the northern part of T. 27 N., R. 9 W.; flows south of west into the Pacific 3 miles above the mouth of Santa Rosa Creek; length, about 10 miles. Land Office map of California, 1907.

Santa Agueda Creek; Santa Barbara County; an intermittent stream, rising on the south slope of the San Rafael Mountains and flowing southward into Santa Ynez River (tributary to the Pacific) 4 miles southeast of Santa Ynez. The creek collects the waters of Lisque, Figueroa, and Morey creeks and other intermittent streams. Santa Ynez and Lompoc sheets.

Santa Ana Creek; Ventura River basin; Ventura County; rises in the southern part of T. 5 N., R. 24 W., San Bernardino base and meridian, on the south slope of Santa Ynez Mountains, at altitude 4,350 feet above sea level; flows southeasterly 4½ miles, then nearly south 5 miles to its junction with Coyote Creek (tributary to Ventura River, which discharges to the Pacific); fall, 3,900 feet. Ventura sheet.

Santa Ana River; San Bernardino, Riverside, and Orange counties; rises in the southeastern part of T. 1 N., R. 2 E., San Bernardino base and meridian, about 6 miles northeast of San Gorgonio Mountain, at altitude 8,000 feet above sea level; flows westerly about 25 miles to mouth of its upper canyon, thence southwesterly across San Bernardino Valley, through the lower canyon in the Santa Ana Mountains, and across the Coastal Plain to the Pacific Ocean at Newport Beach. Although the course of the stream measures about 100 miles,

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there is continuous surface flow from the mountains to the sea only during winter floods. Taken as a whole, the basin lies lengthwise the San Bernardino Valley within 2 to 6 miles of its southern edge and from 6 to 16 miles from the base of the mountains on the north.

"All other streams in the basin are its tributaries, either above or below ground, and the river itself has a subterranean as well as a surface existence. The visible Santa Ana River through this valley, with its perennial flowing over the greater portion of its course, is no more all of the Santa Ana River there is, than are the nearly always dry beds, or washes, in the plain of many of the north and south canyon streams all there is in each instance of these; and so, while this river loses and regains its waters, and acquires other waters on its course, the streams which come laterally into the valley and are so promptly lost along its edge (through some hidden channels, though much spread out perhaps and divided in the underground formation) pass on down the slopes and mingle with those of the subterranean flowings of the Santa Ana Canyon."[1]

The principal tributaries of the Santa Ana are Bear, Alder, Mill, Lytle, and Chino creeks. The river also at times may receive through Temescal Creek overflow from Lake Elsinore, which in turn may receive surplus waters from San Jacinto River. The area drained by the San Jacinto is therefore properly a part of the Santa Ana basin.

Gaging station near Mentone (1896–1912).

Authorities: San Gorgonio, San Jacinto, Redlands, Elsinore, San Bernardino, Cucamonga, Pomona, and Corona sheets; Water-Supply Paper U. S. Geol. Survey No. 291, 1912, pp. 41–42; Hall, Wm. Ham., Irrigation in California. (See footnote.)

Santa Ana River, South Fork; San Bernardino County; rises in the southeastern part of T. 1 N., R. 1 E., San Bernardino base and meridian, in Dollar Lake, at altitude 9,250 feet above sea level; flows in general somewhat east of north to its junction with Santa Ana River (tributary to the Pacific); length, about 5 miles; fall, 2,950 feet; intermittent. San Gorgonio sheet.

Santa Anita Canyon Creek; San Gabriel River basin; Los Angeles County; rises in the south-central part of T. 2 N., R. 11 W., San Bernardino base and meridian, half a mile northeast of Mount Wilson, at altitude 5,000 feet above sea level; flows southeastward 2½ miles, then in general southerly and southeasterly to San Gabriel Valley (drained by San Gabriel River, which discharges to the Pacific). Its drainage area comprises almost exactly 10 square miles, of which a large part lies in the high mountains and is well exposed to receive the storm clouds and their precipitation. Its low-water flow entirely disappears at the edge of the plain; its wash is about one-quarter mile wide and extends southerly, and, being joined by the Little Santa Anita, turns to the southeast, divides and spreads into several arms, so that the Santa Anita flood waters reach the San Gabriel 5 or 6 miles below the mouth of the canyon. Pasadena and Pomona sheets; Irrigation in southern California, Sacramento, 1888, pp. 378–379.

Santa Anita Canyon Creek, Little; San Gabriel River basin; Los Angeles County, rises in the northwestern part of T. 1 N., R. 11 W., San Bernardino base and meridian, at altitude 3,250 feet above sea level; flows southeastward, and comes to the plain about a mile west of the Santa Anita; its wash joins that of the Santa Anita about 1½ miles below the canyon mouth; its basin comprises about 4 square miles. Pasadena sheet; Irrigation in southern California, Sacramento, 1888, p. 379.

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[1] Hall, Wm. Ham., Irrigation in California [southern]: Report of the State Engineer of California on irrigation and the irrigration question, pt. 2, Sacramento, 1888, pp. 119–120.

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Santa Anita Canyon Creek, West Fork; San Gabriel River basin; Los Angeles County; rises in the southwestern part of T. 2 N., R. 11 W., San Bernardino base and meridian, on the south slope of Mount Wilson, at altitude 4,750 feet above sea level; flows southeastward 3 miles into Santa Anita Canyon; fall, 2,750 feet. Pasadena sheet.

Santa Barbara Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, 1½ miles northwest of Strawberry Peak and 2 miles east of the head of Sisquoc River, at altitude 5,500 feet above sea level; flows in general east of north to its junction with Cuyama River (Santa Maria River, which discharges to the Pacific) in the northeastern part of T. 9 N., R. 25 W., San Bernardino base and meridian; length, about 14 miles; fall, 2,900 feet; tributaries, Chokecherry, Alamo, and Dry Canyon creeks; intermittent below mouth of canyon. Santa Ynez sheet.

Santa Clara River; Los Angeles and Ventura counties; rises at the northwestern end of the Sierra Madre, in the southwestern part of T. 6 N., R. 12 W., San Bernardino base and meridian; flows westward through what are known locally as Piru, Sespe, and Santa Clara Valleys, and discharges into the Pacific Ocean about 6 miles south of Ventura. The river is about 75 miles long and its principal tributaries are San Francisquito, Castac, Piru, Sespe, and Ojai creeks, all entering from the north. At most points on the drainage line the channel is dry during the summer months. Although the first gold discovered in California was found on San Francisquito Creek, mining has never been extensively developed in that basin. Small irrigation works, consisting mainly of pipe lines, cement ditches and flumes, are utilized in the valley. Gaging station at Fillmore (1911–12). Land Office map of California, 1907; Tujunga, Fernando, Tejon, Santa Susana, Camulos, Santa Paula, and Hueneme sheets; Water-Supply Paper U. S. Geol. Survey No. 300, 1912, p. 43.

Santa Cruz Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of San Rafael Mountain, at altitude 6,000 feet above sea level; flows southeastward 6 miles, then westward and southwestward 12 miles to its junction with Santa Ynez River (tributary to the Pacific); fall, 5,300 feet; principal tributary, East Fork; intermittent. Santa Ynez sheet.

Santa Cruz Creek, East Fork; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the San Rafael Mountains, at altitude 5,500 feet above sea level; flows southwestward 6 miles to its junction with Santa Cruz Creek (tributary to Santa Ynez River, which discharges to the Pacific); fall, 3,200 feet. Santa Ynez sheet.

Santa Felicia Canyon Creek; Los Angeles and Ventura counties; rises in the northeastern part of Temescal Rancho, at altitude 2,000 feet above sea level; flows southwestward 6 miles into Piru Creek which discharges into Santa Clara River (tributary to the Pacific); fall, 1,000 feet; tributaries, Oak Canyon and Leckler Canyon creeks; intermittent. Santa Susana and Camulos sheets.

Santa Gertrudis Creek; Riverside County; an intermittent stream flowing westward from the western part of T. 7 S., R. 1 W., San Bernardino base and meridian; length, about 12 miles; discharges into the valley of Murietta Creek (tributary to Santa Margarita River, which discharges to the Pacific) 2½ miles northwest of Temecula. Elsinore sheet.

Santa Lucia Canyon; Santa Barbara County; a drainage way extending southwestward from the west end of the Purisima Hills toward the valley of Santa Ynez River (tributary to the Pacific). Lompoc sheet.

Santa Margarita River [Temecula River]; Riverside and San Diego counties; rises on the western slope of the San Jacinto Mountains in the north-

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western part of San Diego County just north of the head of San Luis Rey River; flows northwestward to Temecula in Riverside County, then southwestward through Temecula Canyon into San Diego County, and discharges into the Pacific 4 miles northwest of Oceanside. Called Temecula Creek or Temecula River above Temecula Valley. The basin lies north of the area drained by the San Luis Rey and south of the San Jacinto basin. The river is no exception to the rule of light summer flow and winter torrents which applies to all southern California streams. Its three main tributaries drain an elevated but sparsely watered region of large area back of the Coast Range, and unite at the head of Temecula Canyon, about 25 miles from the coast, at an elevation of 950 feet. The canyon is about 13 miles long and opens out into a flat, fertile valley at an elevation of about 300 feet. Near the mouth of the canyon it receives Deluz Creek, a stream from the Santa Rosa Mountains from the north.

Gaging station on Temecula Creek near Temecula (1905–6).

Authorities: San Jacinto, Elsinore, Ramona, and San Luis Rey sheets. Hall, Wm. Ham., Irrigation in California [southern]; Report of State Engineer of California on irrigation and the irrigation question, pt. 2, Sacramento, 1888, pp. 46–47; Water-Supply Paper U. S. Geol. Survey No. 300, p. 38

Santa Maria Canyon Creek; Santa Barbara County; an intermittent stream, 2 miles long, rising in the southern part of T. 10 N., R. 32 W., San Bernardino base and meridian, and flowing southwestward toward the valley of Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific) in Tepusquet Rancho. Lompoc sheet.

Santa Maria Creek; San Diego County; the main tributary of San Dieguito River (tributary to the Pacific) from the south; drains about one-third the entire basin, but is less constant in flow than either the Pamo, Santa Ysabel, or Guejito [Roden Canyon?] fork. The creek enters Santa Maria Valley from the Ballena Valley at an elevation of about 1,500 feet above sea level, by a narrow channel between high hills, in places rock bound and in other places open and bordered by strips of cultivable lands; it leaves it through a precipitous, rocky, canyon, about 4 miles long, with a total fall in that distance of 800 to 900 feet, from the lower end of Santa Maria Valley to San Pasqual Valley. Called Hatfield Creek above Santa Maria Valley on the Ramona sheet. Description abstracted from Irrigation in California [southern]; Report of State Engineer of California on irrigation and the irrigation question, by Wm. Ham. Hall, pt. 2, Sacramento, 1888, pp. 43, 44.

Santa Maria River; Ventura, San Luis Obispo, and Santa Barbara counties; rises in the Santa Barbara National Forest in the northwestern part of T. 7 N., R. 21 W., San Bernardino base and meridian, at altitude 6,000 feet above sea level; flows northwestward about 70 miles, then irregularly southwestward to the point at which it enters the Pacific Ocean at Guadalupe; forms the boundary between San Luis Obispo and Santa Barbara counties. Called Cuyama River above the mouth of the Sisquoc, its principal tributary. Practically from source to mouth the channel of the Santa Maria is shown on the maps as a broad sandy wash. Gaging station near Santa Maria (1903–1906). Mount Pinos, Santa Ynez, Lompoc, and Guadalupe sheets.

Santa Monica Canyon Creek; Los Angeles County; an intermittent stream, about 8 miles long, draining a small area in the Santa Monica Mountains and flowing in general somewhat west of south to Santa Monica Bay, where it enters the Pacific. Called Mandiville Canyon in upper stretch. Calabasas and Santa Monica sheets.

Santa Monica Canyon Creek; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains, in T. 4 N., R. 25 W., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows southward, and dis-

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charges to the Pacific through El Estero, a tidal marsh west of Carpinteria; length, 5 miles; intermittent. Santa Barbara special sheet.

Santa Paula Creek; Ventura County; rises in the central part of T. 5 N., R. 21 W., San Bernardino base and meridian, on the eastern slope of Topatopa Bluff, at altitude 6,000 feet above sea level; flows eastward and southeastward 2½ miles, southward and southwestward through Santa Paula Canyon 5 miles, then in general east of south into Santa Clara River (tributary to the Pacific); fall, 5,650 feet; flows along north base of Santa Paula ridge; principal tributary, Sisar Creek. Gaging station near Santa Paula (1911–12). Santa Paula sheet.

Santa Rosa Creek; Russian River basin; Sonoma County; rises in the eastern part of T. 7 N., R. 7 W., Mount Diablo base and meridian; flows very irregularly westward, passing through Santa Rosa, to T. 7 N., R. 9 W., then northward to Mount Olivet, where it turns again and flows northwestward to its junction with Russian River (tributary to the Pacific) 1 mile north of Forestville; length, about 20 miles; principal tributaries, Los Alamos, and Bennett creeks, Laguna de Santa Rosa, and Mark West Creek. Punnett's map of Sonoma County. On the Land Office map of California, 1907, Bennett Creek is called Matanzas Creek.

Santa Rosa Creek; San Luis Obispo County; rises in the western part of T. 27 S., R. 10 W., Mount Diablo base and meridian; flows westward into the Pacific 3 miles northwest of Whiterock; length, 10 miles. Land Office map of California, 1907.

Santa Rosa Creek; Santa Ynez River basin; Santa Barbara County; an intermittent stream rising on the south slope of the Purisima Hills and flowing southward to the Santa Ynez River (tributary to the Pacific). Lompoc sheet.

Santa Ynez Canyon Creek; Los Angeles County; an intermittent stream, 5½ miles long, draining a small area in the Santa Monica Mountains and flowing southward into the Pacific through Santa Monica Bay. Calabasas sheet.

Santa Ynez River; Santa Barbara County; rises near the boundary line between Santa Barbara and Ventura counties, where the San Rafael and Santa Ynez mountains merge; flows nearly due west, and enters the Pacific Ocean at Surf about 8 miles northeast of Point Arguello lighthouse, where the coast line makes a sharp turn to the north.

The basin extends for a distance of about 80 miles parallel to the coast line and north of the Santa Ynez Mountains and comprises approximately 900 square miles. Four-fifths of this area is mountainous, elevations ranging from 3,000 to 4,000 feet in the Santa Ynez Range, and from 4,000 to 6,000 feet in the San Rafael, a few peaks, such as Mount Pinos, exceeding 8,000 feet above sea level. The greater part of the basin is included in a national forest and is sparsely covered with brush and small trees.

The mean annual precipitation in the area ranges from 20 to 30 inches, the increase being gradual from the lower to the higher elevations. The precipitation is almost entirely in the form of rain, but the higher elevations receive a light fall of snow.

Water is diverted for irrigation above Lompoc, and the present water rights exceed the low-stage flow of the stream.

The basin affords good storage sites. Several reservoirs have already been surveyed whose combined capacity far exceeds the mean annual run-off of the basin.

The river receives many small tributaries but the only one of importance is Mono Creek, which drains 120 square miles of the southern slope of the San Rafael Mountains and joins the Santa Ynez about 13 miles below its source.

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Gaging stations near Santa Barbara (1903–1912); near Lompoc (1906–1912). Santa Barbara, Santa Ynez, Ventura, Lompoc, and Guadalupe sheets. Water-Supply Paper U. S. Geol. Survey No. 271, 1912, p. 110.

Santa Ysabel Creek. *See* San Dieguito River.

Santiago Creek; Orange County; rises in the southwestern part of T. 5 S., R. 6 W., San Bernardino base and meridian, 1½ miles southeast of Santiago Peak, at altitude 3,000 feet above sea level; flows northwestward 17 miles, then southwestward 8 miles to its junction with Santa Ana River (tributary to the Pacific) near the city of Santa Ana; fall, 2,900 feet, of which 2,500 feet is made in the northwestward-flowing stretch; tributaries, streams draining Harding, Silverado, Baker, Black Star, and Sierra canyons; intermittent. Corona sheet.

San Timoteo Canyon Creek; Riverside and San Bernardino counties; rises in T. 3 S., R. 1 W., San Bernardino base and meridian; flows northwestward to its junction with Santa Ana River (tributary to the Pacific). The stream rarely runs in considerable volume at its entrance to San Bernardino Valley except for short periods after heavy rains; principal tributaries, Little San Gorgonio and Yucaipe creeks. San Jacinto, Elsinore, and Redlands sheets.

San Tomas Aquinas Creek; Santa Clara County; an intermittent stream flowing in general northward to Santa Clara Valley, west of the city of Santa Clara; sinks before reaching Campbell Creek (tributary to Guadalupe River, which discharges to San Francisco Bay). San Jose sheet.

San Vicente Creek; San Diego County; rises in the central part of T. 13 S., R. 2 E., San Bernardino base and meridian, at altitude 2,500 feet above sea level; flows southwestward into San Diego River (which discharges to the Pacific through False Bay) near Lakeside; intermittent; length, 20 miles; fall, 2,100 feet; chief tributary, Padre Barona Creek. Ramona and Cuyamaca sheets.

San Vicente Creek; San Mateo County; rises in T. 4 S., R. 6 W., Mount Diablo base and meridian, on the east slope of South Peak Mountain, at altitude 1,600 feet above sea level; flows in general southwestward and enters the Pacific 1 mile south of Montara Point; length, about 3½ miles. San Mateo sheet.

San Vicente Creek; Santa Cruz County; rises on the west slope of Ben Lomond Mountain, in the northeastern part of T. 10 S., R. 3 W., Mount Diablo base and meridian; flows southwestward about 7 miles to the point at which it enters the Pacific near Davenport in San Vicente Rancho. Santa Cruz sheet.

San Ysidro Creek; San Diego County; rises in the eastern part of T. 10 S., R. 4 E., San Bernardino base and meridian, at an altitude of 5,000 feet above sea level; flows southwestward 6 miles to the east end of Warner Valley, where its waters sink before reaching Buena Vista Creek (tributary through Carrizo Creek to San Luis Rey River, which discharges to the Pacific) to which the area naturally drains; fall, 1,700 feet. Ramona sheet.

Sarco Creek; Napa County; rises in the central part of T. 6 N., R. 3 W., Mount Diablo base and meridian, on the north and east slopes of George Mountain; flows southwestward into Soda Creek (tributary to Napa River, which discharges to San Pablo Bay); length, 5 miles. Napa sheet.

Sardine Lake; Mono County, Mono National Forest, 1 mile east of Mono Pass; inlet, Walker Creek, which passes through this lake and Walker Lake to its junction with Rush Creek (tributary to Mono Lake); altitude, 9,850 feet. Mount Lyell sheet.

Sausal Creek; San Mateo County; a stream, about 1 mile long, flowing northeastward into Corte de Madero Creek (tributary through Searsville Lake to San Francisquito Creek, which discharges into San Francisco Bay) near Portola. Santa Cruz and Palo Alto sheets.

Sawmill Creek; Klamath River basin; Trinity County; rises in the eastern part of T. 4 N., R. 8 E., Humboldt base and meridian; flows in general east of north into Trinity River (tributary to Klamath River, which discharges to the

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Pacific) near Big Bar; length, about 4 miles. Punnett's map of Trinity County.

Sawmill Creek; Owens River basin; Inyo County; Inyo National Forest; rises on the north slope of Mount Baxter, at altitude 11,900 feet above sea level; flows northeastward into Owens Valley where its waters sink; length, about 7 miles; fall, 8,000 feet. Gaging station near Independence (1906–1910). Mount Whitney sheet.

Sawpit Canyon Creek; Los Angeles County; San Gabriel River basin; rises in the northwestern part of T. 1 N., R. 10 W., San Bernardino base and meridian, on the southern slope of Monrovia Hill, at altitude 4,000 feet above sea level; flows southeastward 1½ miles, then southwestward 2 miles to the mouth of its canyon near Monrovia; fall above mouth of canyon, about 3,000 feet. Pomona sheet.

Scholl Canyon; Los Angeles County; a drainage way in the southern part of San Rafael Hills, opening westward toward the valley of the Los Angeles (tributary to the Pacific) near Glendale. Pasadena sheet.

Schoolhouse Canyon Creek; Santa Barbara County; an intermittent stream, 7 miles long, rising in the southern part of T. 10 N., R. 28 W., San Bernardino base and meridian, and flowing east of north into Cuyama River (Santa Maria River, which discharges to the Pacific); tributary, Deadman Canyon Creek. Santa Ynez sheet.

Schooner Gulch Creek; Mendocino County; rises in the northwestern part of T. 11 N., R. 15 W., Mount Diablo base and meridian; flows northwestward; enters the Pacific 1½ miles northwest of Rough and Ready Landing; length, 4 miles. Punnett's map of Mendocino County.

Schumann Canyon Creek; Santa Barbara County; an intermittent stream, 4 miles long, rising in the northwest part of Casmalia Rancho and flowing northwestward to Pacific Ocean. Guadalupe sheet.

Sciad Creek; Siskiyou County; rises in the northern part of T. 47 N.. R. 11 W., Mount Diablo base and meridian, on the south slope of Siskiyou Mountains; flows southward 4 miles, then southwestward 5 miles to its junction with Klamath River (tributary to the Pacific) near Lowders. Punnett's map of Siskiyou County.

Scorpion Creek; Trinity County; rises in the northern part of T. 37 N., R. 7 W., Mount Diablo base and meridian, at altitude 4,000 feet above sea level; flows westward to its junction with Trinity River (tributary to Klamath River, which flows to the Pacific); length, 3 miles; fall, 1,500 feet. Shasta sheet.

Scott Creek; Coyote River basin; Alameda County; a stream, about 5 miles long, rising on the north slope of Monument Peak; flows southwestward along the boundary between Alameda and Santa Clara counties to the channel of Penitencia Creek (tributary to Coyote River) in the tidal marsh through which the river enters San Francisco Bay. San Jose sheet.

Scott Creek; Santa Cruz County; rises in the northern part of T. 9 S., R. 3 W., Mount Diablo base and meridian, south of Blooms Mill; flows southwestward 5 miles, then in general southeastward about 5 miles to the point at which it enters the Pacific in Agua Puerca y las Trancas Rancho; tributaries, Mill, Big, Little, Archibald, and Molino creeks. Santa Cruz sheet.

Scott River; Siskiyou County; formed in the western part of T. 40 N., R. 8 W., Mount Diablo base and meridian, by the union of its South and East forks. The East Fork, which drains the larger area and is therefore considered the continuation of the main stream, is formed by a number of branching tributaries draining the north slopes of Scott Mountains, and its general course is southwestward to the junction with the South Fork. Punnett's map of Siskiyou County applies the name East Fork Scott River to a small tributary named on

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the Shasta sheet Kangaroo Creek. On the Shasta sheet the name East Fork is applied to the most western of the head-water streams, that is, to the one heading immediately opposite the head of Willow Creek which flows to Shasta River. The stream here considered the head of the East Fork, using extent of drainage area as a criterion, is one which starts in the northwestern part of T. 40 N., R. 6 W., flows northwestward about 5 miles and then turns abruptly to the west and southwest. Below these forks the main river flows northward about 22 miles, then somewhat north of west 12 miles, makes a sharp bend to the north and east around the west end of Scott Bar Mountains, and enters Klamath River (tributary to the Pacific) in the extreme northwestern part of T. 45 N., R. 10 W.; total length below the forks, 50 miles; length of the East Fork above the junction, about 18 miles, making length of the river from the Klamath to the head of the longest branch of the East Fork, 68 miles; principal tributaries below the forks, Wildcat, French, Clarks, Etna, Paterson, Cherry, Evans, Kelsey, Middle, Thompson, and Mill creeks.

The crest of Scott Mountains is about 7,000 feet above sea level.

Gaging stations on East Fork near Callahan (1910–1912) and on main stream near Scott Bar (1911–12).

Shasta sheet and Punnett's map of Siskiyou County.

Scott River, East Fork. *See* Scott River.

Scott River, South Fork; Siskiyou County; rises in the northwestern part of T. 39 N., R. 9 W., Mount Diablo base and meridian, in Jackson Lake; flows southeastward 1 mile, northeastward 8 miles, and unites with the East Fork to form Scott River (tributary to Klamath River, which discharges to the Pacific); principal tributary, Bowlder Creek. Punnett's map of Siskiyou County.

Scotts Lake; Alpine County; 2 miles north of east of Stevens Peak; 2 small inlets; outlet, an intermittent stream flowing south of east to West Fork of Carson River (tributary through Carson River to Carson Sink); altitude, 8,050 feet; fall of outlet, about 1,000 feet. Markleeville sheet.

Scotty Creek; Sonoma County; rises in the north-central part of Bodega Rancho; flows in general southwestward about 3 miles to the point at which it enters the Pacific. Punnett's map of Sonoma County.

Seal Creek; Contra Costa County; rises in the northeastern part of T. 1 N., R. 1 W., Mount Diablo base and meridian, west of Kirker Pass, at altitude 750 feet above sea level; flows in general northwestward about 10 miles to Hastings Creek in the tidal marsh on the south shore of Suisun Bay; principal tributary, Mount Diablo Creek; intermittent in upper course. Mount Diablo, Antioch, and Carquinez sheets.

Seal Creek; San Mateo County; a channel in the marsh at the south end of San Francisco Bay, 2 miles east of San Mateo. San Mateo sheet.

Searles Dry Lake; San Bernardino County; between the Slate Range and Argus Mountains. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I and pp. 42–43, on which the springs near Searles Dry Lake are described.

Searsville Lake; San Mateo County; between Canada de Raymundo and Canada del Corte de Madera ranchos; inlets, Martin and Corte de Madera creeks and San Francisquito Creek, which flows through the lake into San Francisco Bay. Santa Cruz and Palo Alto sheets.

Sebrina Lake; Inyo County, Inyo National Forest; southwestern part of T. 8 S., R. 31 E., Mount Diablo base and meridian; inlet and outlet, Middle Fork of Bishop Creek, which flows through the lake to its junction with South Fork with which it forms Bishop Creek (tributary to Owens River, which discharges to Owens Lake); altitude, 9,170 feet. Mount Goddard sheet.

See Canyon Creek; San Luis Obispo County; rises in the San Luis Range in T. 31 S., R. 11 E., Mount Diablo base and meridian; flows southeastward 5½

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miles into San Luis Obispo Creek (tributary to the Pacific) near Sycamore Springs; fall, 700 feet; principal tributary, Davis Canyon Creek. Port Harford and Arroyo Grande sheets.

Sempervirens Creek; Santa Cruz County; rises in the California Redwood Park, at altitude about 1,400 feet above sea level; flows southward to Blooms Creek (tributary to East Waddell Creek and thus to Waddell Creek, which discharges to the Pacific); length, about 2 miles; tributary, Union Creek. Santa Cruz sheet.

Senor Canyon Creek, Ventura River basin. *See* San Antonio Creek.

Sepulveda Canyon Creek; Los Angeles County; an intermittent stream, about 5 miles long, draining a small area in the Santa Monica Mountains and flowing southeastward toward Ballona Creek; sinks north of the Soldiers' Home. Santa Monica sheet.

Sespe Creek; Santa Barbara and Ventura counties; rises in Santa Barbara County in the eastern part of T. 6 N., R. 25 W., San Bernardino base and meridian; flows in general eastward to the southeastern part of T. 6 N., R. 20 W., where it turns abruptly southward to join Santa Clara River (tributary to the Pacific) near Bardsville; including its major windings, the creek is about 45 miles long; most of its tributaries are short streams draining the southern slopes of Pine Mountain and the northern slope of the Topatopa Mountains; the entire basin is in the Santa Barbara National Forest. Gaging station near Sespe (1911–12). Mount Pinos, Tejon, and Camulos sheets.

Sespe Creek, Little; Ventura County; an intermittent stream, 2 miles long, rising in the northwestern part of T. 4 N., R. 19 W., San Bernardino base and meridian, and flowing southwestward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); tributary, Fourfork Creek. Camulos sheet.

Sevenmile Creek; Klamath County, Oreg.; rises in the western part of the county; flows northeastward 5 miles, then southward to Upper Klamath Lake (outlet, Klamath River, which discharges to the Pacific); marshy throughout lower course; length, about 22 miles; principal tributaries, Cherry and Rock creeks. Ashland sheet.

Seward Creek; Mendocino County; rises in the northwestern part of T. 16 N., R. 13 W., Mount Diablo base and meridian, 1 mile east of Leonard Lake; flows irregularly eastward to its junction with Forsythe Creek (tributary through Russian River to the Pacific); length, 7 miles. Punnett's map of Mendocino County.

Sexton Canyon Creek; Ventura County; an intermittent stream draining a small area in the southwestern part of Ex Mission San Buenaventura Rancho and flowing southward toward Santa Clara River (tributary to the Pacific); tributary, Lake Canyon Creek; fall in 2 miles above edge of valley, 450 feet. Santa Paula sheet.

Seymour Creek; Ventura County; rises in the northern part of T. 8 N., R. 21 W., San Bernardino base and meridian, 2 miles east of Mount Pinos, at altitude 6,800 feet above sea level; flows southeastward 6 miles to its junction with Lockwood Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific) at Griffin; fall, about 1,900 feet; intermittent. Mount Pinos sheet.

Shackelford Creek; Siskiyou County; rises in the east-central part of T. 43 N., R. 12 W., Mount Diablo base and meridian; flows southeastward 10 miles to its junction with Evans Creek, through which it is tributary to Scott River (tributary to Klamath River, which flows to the Pacific); heads in a lake unnamed on the map. Punnett's map of Siskiyou County. On the Land Office

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map of California, 1907, the name Shackelford Creek is applied to the upper stretch of Evans Creek.

Shafer Creek; Alameda Creek basin; Alameda County; an intermittent stream, 1½ miles long, rising in the northwestern part of T. 5 S., R. 3 E., Mount Diablo base and meridian, in Shafer Flat, at altitude 3,450 feet above sea level, and flowing southeastward to Trout Creek (tributary through Arroyo del Valle to Arroyo de la Laguna, and thus to Alameda Creek, which discharges to San Francisco Bay). Tesla sheet.

Shake Creek; San Bernardino County; rises in the eastern part of T. 2 N., R. 3 W., San Bernardino base and meridian, at altitude 6,150 feet above sea level; flows northward and northeastward 2½ miles into Deep Creek (tributary to Mohave River); fall, 1,250 feet; principal tributaries, Cedar and Sheep creeks. Redlands and Deep Creek sheets.

Shasta River; Siskiyou County; formed in the western part of T. 41 N., R. 5 W., Mount Diablo base and meridian, by the union of its North and Middle forks; the North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises on the east slope of China Mountain, at altitude 6,000 feet above sea level; flows eastward 6 miles to the point at which it receives the Middle Fork, and from this junction the river winds northward and northwestward to the western part of T. 46 N., R. 6 W., where it unites with Klamath River (tributary to the Pacific); length, about 40 miles; total fall, 4,000 feet, of which 3,000 feet is made in the first 5 miles; fed by springs issuing from the lava beds at the north base of Mount Shasta; principal tributary, Little Shasta River. Gaging station near Montague (1911–12). Punnett's map of Siskiyou County; Shasta sheet (on which the North Fork is not named).

Shasta River, Little; rises in the eastern part of T. 45 N., R. 3 W., Mount Diablo base and meridian, at altitude 4,600 feet above sea level; flows somewhat south of west to its junction with Shasta River (tributary to Klamath River, which flows to the Pacific); length, about 20 miles; fall, 2,000 feet, of which 1,600 feet is made in the first 9 miles. Shasta sheet.

Shasta River, Middle Fork; Siskiyou County; rises on the north slope of Eddy Mountain in the northwestern part of T. 40 N., R. 5 W., at altitude 6,400 feet above sea level; flows northeastward 6 miles and unites with North Fork to form Shasta River (tributary to Klamath River, which flows to the Pacific); fall above junction with North Fork, 3,300 feet. Shasta sheet.

Sheep Creek; Los Angeles and San Bernardino counties; rises in the northeastern part of T. 3 N., R. 8 W.; flows southeastward 3½ miles through Swartout Valley, then turns and flows northward into Mohave Desert; intermittent. San Antonio sheet.

Sheep Creek; Riverside County; an intermittent stream, 2 miles long, flowing west of north into Deep Canyon Creek, which discharges to the Colorado Desert. Indio special sheet.

Sheep Creek; San Bernardino County; rises in the southwestern part of T. 2 N., R. 2 W., San Bernardino base and meridian, at altitude 6,300 feet above sea level; flows northward 2½ miles to its junction with Shake Creek (tributary to Deep Creek, which discharges to Mohave River); fall, 1,350 feet. Redlands and Deep Creek sheets.

Sheller Creek; Siskiyou County; rises in the south-central part of T. 48 N., R. 6 W., Mount Diablo base and meridian, at altitude 3,600 feet above sea level; flows in general west of south 4 miles into Cottonwood Creek (tributary to Klamath River, which flows into the Pacific); fall, 1,100 feet. Shasta sheet.

Shepard Creek; Diamond Creek basin; Alameda County; an intermittent stream, 1½ miles long, rising in San Antonio Rancho and flowing southwestward

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into Diamond Creek, which discharges through San Leandro Bay to San Francisco Bay. Concord sheet.

Shepard Creek; Owens River basin; Inyo County, Inyo National Forest; rises on the east slope of the Sierra on Junction Peak, at altitude 12,500 feet above sea level; flows southeastward 1½ miles, then northeastward 10 miles to Owens Valley, where its waters sink; fall, 8,500 feet, of which 6,500 feet is made in the first 6 miles; principal tributary, Williamson Creek. Gaging station near Thebe (1906–1909). Mount Whitney sheet.

Shepherd Canyon Creek; San Diego County; rises in eastern part of Ex Mission San Diego Rancho, at altitude 575 feet above sea level; flows southwestward into Murphy Canyon Creek (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; length, 3 miles; fall, 400 feet. La Jolla sheet.

Shields Canyon; Ventura County; a drainage way opening northward to Santa Clara River (tributary to the Pacific) in T. 3 N., R. 19 W., San Bernardino base and meridian. Camulos sheet.

Shovel Creek; Siskiyou County; rises on the east slope of Willow Creek Mountain in the central part of T. 46 N., R. 3 W., Mount Diablo base and meridian; flows northwestward 3 miles, northeastward 6 miles, then again northwestward 6 miles to its junction with Klamath River (tributary to the Pacific) in the central part of T. 48 N., R. 3 W. Shasta sheet and Punnett's map of Siskiyou County.

Shower Creek; Humboldt County; rises in the northern part of T. 2 N., R. 4 E., Humboldt base and meridian; flows northward 3½ miles into Mad River (tributary to the Pacific). Punnett's map of Humboldt County.

Sierra Canyon Creek; Malibu Creek basin; Los Angeles County; an intermittent stream, about 2 miles long, draining a small area in the northwestern part of T. 1 S., R. 18 W., San Bernardino base and meridian, and flowing northeastward into Triunfo Creek (tributary to Malibu Creek, which discharges to the Pacific). Camulos sheet.

Sierra Canyon Creek; Santa Ana River basin; Orange County; rises on the eastern slope of the Santa Ana Mountains, 2 miles southwest of Sierra Peak, at altitude 1,700 feet above sea level; flows southwestward 5 miles into Santiago Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 1,000 feet; intermittent. Corona sheet.

Sierra River; Salinas River basin. *See* Nacimiento Creek.

Silurian Dry Lake; San Bernardino County; in T. 17 N., R. 7 E., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Silverado Canyon Creek; Santa Ana River basin; Orange County; rises on the southwest slope of Bald Peak, at altitude 2,700 feet above sea level; flows westerly 8 miles into Santiago Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, 1,700 feet; principal tributary, Ladd Canyon Creek; intermittent. Corona sheet.

Silverado Canyon Creek; Walker River basin; California-Nevada; rises in Mono County, Cal., in the western part of T. 7 N., R. 25 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level; flows somewhat north of east to its junction with Ferris Canyon Creek (tributary through Sweetwater Creek to East Walker River and thus to Walker River, which discharges to Walker Lake) near Sweetwater in Mineral County, Nev.; length, 5 miles; fall, 3,100 feet, of which 2,000 feet occurs in about 2 miles in the canyon; intermittent in upper course. Bridgeport sheet.

Silver Creek; Carson River basin; Alpine County; rises in the central part of T. 8 N., R. 20 E., Mount Diablo base and meridian, at altitude 9,300 feet

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above sea level; flows northward and northeastward to its junction with East Fork of Carson River (tributary through Carson River to Carson Sink); length about 10 miles; fall, 3,300 feet, of which 1,300 feet is made in the first mile. Gaging station near Markleeville (1910-1912). Markleeville sheet.

Silver Creek; Coyote River basin; Santa Clara County; rises in Yerba Buena Rancho, about 5 miles east of Edenvale; flows northwestward to the valley of Coyote River (tributary to San Francisco Bay) east of San Jose, where it sinks in a marsh. Mount Hamilton and San Jose sheets.

Silver Creek; Mohave Desert; San Bernardino County; T. 3 N., R. 1 W., San Bernardino base and meridian; an intermittent stream, about 3 miles long, flowing northeastward into the Mohave Desert. Deep Creek and San Gorgonio sheets.

Silver Creek; Truckee River basin; Placer County; rises in the western part of T. 16 N., R. 16 E., Mount Diablo base and meridian, at altitude 7,500 feet above sea level; flows in general easterly to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes); length, about 2 miles; fall, 1,450 feet. Truckee sheet.

Silver Creek; Walker River basin; Mono County; rises in the northwestern part of T. 6 N., R. 22 E., Mount Diablo base and meridian, at altitude 9,500 feet above sea level; flows southeastward into West Walker River (tributary to Walker River, which discharges to Walker Lake) in Pickle Meadow; fall, 2,700 feet. Dardanelles sheet.

Silver King Creek; Alpine County; rises in the northeastern part of T. 6 N., R. 21 E., Mount Diablo base and meridian, at altitude 10,200 feet above sea level; takes a general northerly course to its junction with East Fork of Carson River (tributary through Carson River to Carson Sink) in Silver King Valley; length, about 14 miles; fall, 3,700 feet, of which 1,700 feet is made in the first 2 miles. Dardanelles and Markleeville sheets.

Silver Lake; Lassen County. *See* Caribou Lake.

Silver Lake; Mono County, Mono National Forest; west-central part of T. 2 S., R. 26 E., Mount Diablo base and meridian; inlets, Rush Creek and North Fork of Rush Creek; outlet, Rush Creek, which discharges to Mono Lake; altitude, 7,212 feet; fall of Rush Creek in the 5 miles between Silver and Grant Lakes, 152 feet. Mount Lyell sheet.

Silver Dry Lake; San Bernardino County; in T. 15 N., R. 8 E., San Bernardino base and meridian, near the town of Silver Lake; a shallow intermittent body of water, formed in a bowl in the desert by the overflow of Mohave River during seasons of high water; shallow wells sunk near the edge of this lake give an abundant supply of brackish water. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I, p. 55.

Sinbad Creek; Alameda Creek basin; Alameda County; an intermittent stream, about 7 miles long, rising in the central part of T. 3 S., R. 1 W., Mount Diablo base and meridian, at altitude 1,250 feet above sea level, and flowing southeastward to Sunolglen, where it joins Arroyo de la Laguna (tributary to Alameda Creek, which discharges to San Francisco Bay); fall, 1,000 feet; the canyon lies between Pleasanton and Sunol Ridges. Pleasanton sheet.

Sisar Creek; Ventura County; rises in the southeastern part of T. 5 N., R. 22 W., San Bernardino base and meridian, at altitude 4,350 feet above sea level; flows southerly 4 miles, then south of east 2½ miles into Santa Paula Creek (tributary to Santa Clara River, which discharges to the Pacific) near Sulphur Mountain Spring; fall, 3,350 feet; principal tributary, Bear Canyon Creek. Santa Paula sheet.

Sisquoc River; Santa Barbara county; rises in the Santa Barbara National Forest on the west slope of Big Pine Mountain, at altitude 6,000 feet above

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sea level; flows northwestward to its junction with Santa Maria River (tributary to the Pacific) in Santa Maria Valley; length, including major windings, about 45 miles; the drainage basin lies almost wholly in the San Rafael Mountains; the river is marked as intermittent nearly to its head and practically all of its tributaries are intermittent streams. Santa Ynez and Lompoc sheets.

Sisquoc River, South Fork; Santa Maria River basin; Santa Barbara County; an intermittent stream, 3 miles long, rising on the east slope of San Rafael Mountain in the Santa Barbara National Forest, and flowing northeastward to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Skunk Hollow Creek; Santa Clara County; an intermittent stream draining a small area in the northeastern part of T. 8 S., R. 4 E., Mount Diablo base and meridian; flows southeastward to Grizzly Creek, through which it is tributary to Coyote River (tributary to San Francisco Bay). Mount Hamilton sheet.

Slate Creek; San Mateo County: rises in the southeastern part of T. 7 S., R. 3 W., Mount Diablo base and meridian, at altitude 2,300 feet above sea level; flows southwestward 4½ miles into Pescadero Creek, which discharges to the Pacific; fall, 1,800 feet. Santa Cruz sheet.

Slate Creek; Lassen County; rises in the central part of T. 34 N., R. 10 E., Mount Diablo base and meridian; flows northeastward, and discharges into Grasshopper Valley, which has no outlet; length, about 3 miles; intermittent. Honey Lake sheet.

Slate Range Dry Lake; San Bernardino County; south end of Slate Range, southeast of Searles Dry Lake. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Slide Canyon Creek, Little; Mono County; rises in the northeastern part of T. 3 N., R. 23 E., Mount Diablo base and meridian, at altitude 9,750 feet above sea level; flows northward 1½ miles into Robinson Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); fall, 2,100 feet. Bridgeport sheet.

Slide Creek; Trinity County; rises in the northwestern part of T. 37 N., R. 12 W., Mount Diablo base and meridian, on the south slope of New River Mountains, near New River City; flows southwestward into New River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, 7 miles. Punnett's map of Trinity County.

Slim Lake; Inyo County; Inyo National Forest, 1 mile southeast of Kearsarge Pass; 2 inflowing streams; outlet, a stream half a mile long flowing northeastward to an unnamed stream connecting Heart Lake with Little Pine Creek (tributary to Owens Valley); altitude, 10,578 feet. Mount Whitney sheet.

Smith Creek; Alameda Creek basin; Santa Clara County; rises in the southwestern part of T. 7 S., R. 4 E., Mount Diablo base and meridian, on the western slope of Pine Ridge, at altitude about 3,250 feet above sea level; flows westward about 3 miles through Horse Valley, then northwestward about 10 miles to the southwestern part of T. 6 S., R. 3 E., where it joins Isabel Creek to form Arroyo Hondo (tributary to Calaveras Creek and thus to Alameda Creek, which discharges to San Francisco Bay); principal tributary, Sulphur Creek, which drains the eastern and southern slopes of Mount Hamilton; fall, above junction with Isabel Creek, about 1,500 feet. Mount Hamilton sheet.

Smith Creek; Colorado Desert; Riverside County; rises in the western part of T. 2 S., R. 1 E., San Bernardino base and meridian, at altitude of 3,900 feet above sea level; flows southwestward 3 miles to a point 2 miles northeast of Beaumont, at the western end of San Gorgonio Pass, which slopes eastward toward the Colorado Desert. San Jacinto sheet.

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Smith Creek; Russian River basin; Sonoma County; rises in the north-central part of T. 7 N., R. 10 W., Mount Diablo base and meridian; flows north of west 2½ miles into Russian River (tributary to the Pacific). Punnett's map of Sonoma County.

Smith Creek; Tenmile River basin; Mendocino County; rises in the northern part of T. 19 N., R. 16 W., Mount Diablo base and meridian; flows in general somewhat south of west to its junction with the South Fork of Tenmile River (tributary through Tenmile River to the Pacific); length, 7 miles. Punnett's map of Mendocino County.

Smith Creek; Toro Creek basin; San Luis Obispo County; an intermittent stream, 1 mile long, rising in T. 28 S., R. 11 E., Mount Diablo base and meridian, and flowing southeastward into Toro Creek, which discharges to the Pacific in Estero Bay. Cayucos sheet.

Smith Fork; Santa Clara River basin; Ventura County; a drainage way in the northeastern part of T. 7 N., R. 19 W., San Bernardino base and meridian, opening southward to Piru Creek (tributary to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Smith Lake; Trinity County; northern part of T. 36 N., R. 10 W., Mount Diablo base and meridian; one inlet; outlet, Stewart Fork of Trinity River (tributary through Trinity River to the Klamath, which discharges to the Pacific); altitude, about 6,000 feet. Punnett's map of Trinity County.

Smith River; Del Norte County, Cal., Josephine and Curry counties, Oreg.; formed in the western part of T. 17 N., R. 2 E., Humboldt base and meridian, by the junction of its North and Middle forks. The Middle Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises on the western slope of the Siskiyou Mountains in the central part of T. 17 N., R. 5 E., Humboldt base and meridian; flows northwestward 5 miles, then in general southwestward to the point at which it receives the North Fork. Below these forks the main river flows in general southwestward to the north-central part of T. 16 N., R. 1 E., then turns abruptly to the west, and northwest, in which direction it continues to flow to the point at which it enters the Pacific in western T. 18 N., R. 1 W.; length from mouth to head of Middle Fork, about 45 miles; principal tributaries of Middle Fork, Preston and Patrick creeks; below the mouth of the North Fork the principal tributaries are South Fork of Smith and Mill Creek. Gaging station on Middle Fork near Crescent City (1911–12). Punnett's map of Del Norte County.

Smith River, Middle Fork. *See* Smith River.

Smith River, North Fork; Del Norte County, Cal., and Josephine County, Oreg.; rises in the extreme southwestern part of Josephine County, Oreg.; flows in general somewhat west of south into Del Norte County, Cal.; unites with the Middle Fork of Smith River to form Smith River in the western part of T. 17 N., R. 2 E., Humboldt base and meridian; length, including major windings, about 20 miles; principal tributary, Stony Creek. Gaging station near Crescent City (1911–12). Land Office map of Oregon, 1910 (on which it is not named), and Punnett's map of Del Norte County.

Smith River, South Fork; Del Norte County; rises on the western slope of the Siskiyou Mountains, in the northern part of T. 16 N., R. 4 E., Humboldt base and meridian; flows in general southwestward about 12 miles, then takes a northwesterly course to its junction with Smith River (tributary to the Pacific) in the northern part of T. 16 N., R. 1 E.; length, including major windings, 32 miles; principal tributaries, Quartz, Jones, Hurdy Gurdy, Gorton, and Coon creeks from the north, and Goose and Rock creeks from the south. Gaging station near Crescent City (1911–12). Punnett's map of Del Norte County.

Smoky Creek; Trinity County; rises in the eastern part of T. 29 N., R. 12 W.,

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Mount Diablo base and meridian; flows southwestward into South Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); length, about 6 miles. Punnett's map of Trinity County.

Snag Lake; Lassen County; southern part of T. 31 N.. R. 6 E., Mount Diablo base and meridian; altitude, 6,500 feet; no outlet; inlet from Twin Lakes. Lassen Peak sheet.

Snail Canyon Creek; Ventura County; an intermittent stream, 4 miles long, rising in the northern part of T. 6 N., R. 23 W., San Bernardino base and meridian, on the north slope of Pine Mountain; flows northward and northwestward to Cuyama River (Santa Maria River, which discharges to the Pacific). Mount Pinos sheet.

Snake Creek; Washoe County, Nev., and Lassen, County, Cal.; rises in a spring 3 miles southeast of Observation Peak, at altitude about 5,300 feet above sea level; flows southeastward and discharges into the Mud Flat in the western part of Washoe County, Nev.; length in California, about 10 miles; in Nevada, about 12 miles. Honey Lake and Granite Range sheets.

Snake Lake; Modoc County; southeastern part; 1 mile west of the south end of Lower Alkali Lake; outlet, a stream 3 miles long, flowing southeastward to Bare's Creek, which discharges to Lower Alkali Lake; altitude, 5,300 feet. Alturas sheet.

Snow Creek; Riverside County; Tps. 4 and 3 S., R. 3 E., San Bernardino base and meridian; rises on the north slope of San Jacinto Peak (altitude, 10,805 feet) and flows northward to the eastern end of San Gorgonio Pass, which slopes eastward from a point near Beaumont to the Colorado Desert; fall in the 5 miles above the pass, 8,500 feet. San Jacinto sheet.

Snow Lake; Mono County; central part of T. 3 N., R. 23 E.. Mount Diablo base and meridian; outlet, Robinson Creek to East Walker River (tributary through Walker River to Walker Lake); altitude, 10,150 feet; very small. Bridgeport sheet.

Snowy Creek; Ventura County; rises in the northeastern part of T. 6 N., R. 20 W., San Bernardino base and meridian, on the south slope of Alamo Mountain, at altitude 6,500 feet above sea level; flows northeastward into Piru Creek (tributary to Santa Clara River, which discharges to the Pacific); length, 7 miles; fall, 3,500 feet; principal tributaries, Big Cedar and Deadhorse creeks. Tejon sheet.

Soda Creek; Eel River basin; Lake County; rises in the central part of T. 19 N., R. 11 W., Mount Diablo base and meridian; takes a general southeasterly course to its junction with Eel River (tributary to the Pacific); length, about 9 miles. Punnett's map of Mendocino and Lake counties.

Soda Creek; Napa River basin; Napa County; rises in the southern part of T. 7 N., R. 4 W., Mount Diablo base and meridian, at altitude 1,200 feet above sea level; flows southward to its junction with Napa River (tributary to San Pablo Bay) 1 mile northeast of Napa; length, about 9 miles; principal tributaries, Milliken and Sarco creeks. Napa sheet.

Soda Creek; Navarro River basin; Mendocino County; rises in the northern part of T. 13 N., R. 13 W., Mount Diablo base and meridian; flows northward 1 mile, then in general southwestward to its junction with Anderson Creek (tributary through Navarro River to the Pacific) in the eastern part of T. 18 N., R. 14 W.; length, 5 miles. Punnett's map of Mendocino County.

Soda Lake; Salinas River basin; San Luis Obispo County; in T. 31 S., Rs. 19 and 20 E., Mount Diablo base and meridian; an intermittent water body lying on the western border of the Carrizo Plain; the plain is drained northwestward to San Juan Creek, which flows into Estrella Creek, a branch of the Salinas. McKittrick sheet.

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Soda Sink. *See* Mohave River.

Soda Spring Creek; Russian River basin; Mendocino County; rises in the southwestern part of T. 12 N., R. 11 W., Mount Diablo base and meridian; flows southwestward 2 miles into Dry Creek (tributary to Russian River, which flows into the Pacific). Punnett's map of Mendocino County.

Soda Springs Creek; Laurel Creek basin; Solano County; a stream, 2 miles long, draining a small area in the eastern part of Tolenas Rancho and flowing southeastward to Laurel Creek, which discharges into the marsh on the north side of Suisun Bay. Napa sheet.

Soledad Canyon Creek; San Diego County; rises in northeastern part of T. 15 S., R. 3 W., San Bernardino base and meridian, at altitude 350 feet above sea level; flows northwestward about 4 miles to Soledad Valley, where it joins Los Penasquitos Canyon Creek which flows through the valley and passes into the Pacific through a tidal marsh 1 mile southeast of Delmar; principal tributary, Carroll Canyon Creek. La Jolla sheet.

Solomon Canyon; Santa Barbara County; a drainage way in the Solomon Mountains opening northward to the valley of Santa Maria River (tributary to the Pacific). Lompoc sheet.

Solstice Canyon Creek; Los Angeles County; an intermittent stream, 4 miles long, rising on the southern slope of Santa Monica Mountains, in T. 1 S., R. 18 W., and flowing southeastward into the Pacific Ocean. Camulos sheet.

Sonoma Creek; Sonoma County; rises in the north-central part of T. 7 N., R. 6 W., Mount Diablo base and meridian; takes a general southeasterly course to the point at which it enters San Pablo Bay; length, about 28 miles; in the 5-mile stretch above its mouth is connected by sloughs with Napa River. Napa sheet; Punnett's map of Sonoma County.

Soto Creek; Pajaro River basin; San Benito County; rises in the southern part of T. 13 S., R. 5 E., Mount Diablo base and meridian; flows northeastward into San Benito River (Pajaro River, tributary to the Pacific in Monterey Bay); length, about 4 miles. Land Office map of California, 1907.

South Eel River. *See* Eel River.

South Lake; Inyo County; Inyo National Forest; central part of T. 9 S., R. 31 E., Mount Diablo base and meridian; inlet and outlet, South Fork of Bishop Creek (tributary through Bishop Creek to Owens River, which discharges to Owens Lake); altitude, 9,750 feet. Mount Goddard sheet.

Sprague River; Klamath County, Oreg.; formed by the junction of its North and South forks in the eastern part of Klamath County; flows north of west about 40 miles, then southwestward to the point at which it unites with Williamson River (tributary to Upper Klamath Lake and thus to Klamath River, which discharges to the Pacific); principal tributary, Sycan River. Klamath sheet.

Sprague River, North Fork; Klamath County, Oreg.; rises in the eastern part of the county; flows southwestward to its junction with the South Fork with which it forms Sprague River (tributary through Williamson River to Upper Klamath Lake and thus to Klamath River, which discharges to the Pacific). Land Office map of Oregon, 1910; Klamath sheet.

Sprague River, South Fork; Lake and Klamath counties, Oreg.; rises in Lake County in the Fremont National Forest; flows northwestward into Klamath County where it unites with the North Fork to form Sprague River (tributary through Williamson River to Upper Klamath Lake and thus to Klamath River, which discharges to the Pacific); length, about 25 miles. Land Office map of Oregon, 1910; Klamath sheet.

Spring Branch; Gualala River basin; Mendocino County; rises in the southwestern part of T. 12 N., R. 13 W., Mount Diablo base and meridian; flows

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southwestward 2 miles into the North Fork of Gualala River (tributary through Gualala River to the Pacific). Punnett's map of Mendocino County.

Spring Branch; Solano County; an intermittent stream, about 5 miles long, rising on the north slope of the Potrero Hills and flowing westward to the tidal marsh on the north side of Suisun Bay, in which it joins Suisun Creek. Antioch and Carquinez sheets.

Spring Canyon Creek; San Diego County; rises in T. 15 S., R. 2 W., San Bernardino base and meridian, at altitude 900 feet above sea level; flows southward into San Diego River, which discharges to the Pacific through False Bay; intermittent; length, 3½ miles; fall, 600 feet. La Jolla sheet.

Spring Creek; Klamath River basin; Klamath County, Oreg.; rises in springs north of the Klamath Agency; flows west of south 1½ miles into Crooked River (tributary through Anna River to Upper Klamath Lake, which discharges through Klamath River to the Pacific). Klamath sheet.

Spring Creek; Santa Margarita River basin; Riverside County; a southward-flowing stream, about 2 miles long, draining the southeastern corner of T. 7 S., and the northeastern corner of T. 8 S., R. 1 W., San Bernardino base and meridian; flows toward Nigger Valley on Temecula Creek (Santa Margarita River, which discharges to the Pacific). San Jacinto sheet.

Sproul Creek; Humboldt County; rises in the northeastern part of T. 5 S., R. 2 E., Humboldt base and meridian; flows southeastward 2 miles, then northeastward 3 miles into South Fork of Eel River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Squaw Creek; Eel River basin; Humboldt County; rises in T. 4 S., R. 4 E., Humboldt base and meridian; flows southwestward into East Branch of South Fork of Eel River (tributary through South Fork of Eel River to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Squaw Creek; Mattole River basin; Humboldt County; rises in the central part of T. 3 S., R. 1 W.; flows northwestward 5 miles, then northeast, north, and northwest 2½ miles into Mattole River (tributary to the Pacific). Punnett's map of Humboldt County.

Squaw Creek; Russian River basin; Mendocino County; rises on the west slope of the Coast Range in T. 12 N., R. 9 W., Mount Diablo base and meridian; flows westward to its junction with Russian River (tributary to the Pacific); length, 9 miles. Punnett's map of Mendocino and Lake counties.

Squaw Creek; Russian River basin; Sonoma County; rises on the western slope of the Coast Range in the northeastern part of T. 11 N., R. 9 W., Mount Diablo base and meridian; flows northwestward 2 miles, then southwestward 2 miles to its junction with Big Sulphur Creek through which it is tributary to Russian River (tributary to the Pacific). Punnett's map of Sonoma County.

Squaw Creek; Truckee River basin; Placer County; rises in the southeastern part of T. 16 N., R. 15 E., Mount Diablo base and meridian, at altitude 8,000 feet above sea level; flows east and northeast to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes); length, about 5 miles; fall, 1,900 feet. Truckee sheet.

Squirrel Gulch Creek; Trinity County; rises in the central part of T. 37 N., R. 7 W., Mount Diablo base and meridian, at altitude 3,600 feet above sea level; flows southeastward to its junction with East Fork of Trinity River (tributary through Trinity River to Klamath River, which flows to the Pacific); length, 5 miles; fall, 1,300 feet. Shasta and Red Bluff sheets.

State Creek; Humboldt County; rises in the northeastern part of T. 11 N., R. 4 E. and the northwestern part of T. 11 N., R. 5 E., Humboldt base and meridian; takes a general southerly course to its junction with Klamath River

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(tributary to the Pacific); length, about 10 miles. Punnett's map of Humboldt County.

Steamboat Slough; Sonoma County; extends northward and eastward from Third Napa Slough; one of the many sloughs in the salt water marsh between Sonoma Creek and Napa River. Napa sheet.

Steele Canyon Creek; San Diego County; rises in the northern part of T. 17 S., R. 1 E., San Bernardino base and meridian, near Jamul, at altitude 950 feet above sea level; flows north of west about 4½ miles into Sweetwater River (tributary to the Pacific through San Diego Bay); fall, about 600 feet; intermittent. Cuyamaca sheet.

Steer Creek, Carpinteria Creek basin. *See* Gobernador Creek.

Steinberger Creek; a channel in the tidal marsh at the south end of San Francisco Bay. Haywards sheet.

Steiner Creek; San Luis Obispo County; rises 4 miles north of the city of San Luis Obispo; flows very irregularly southward into Brizziolari Creek (tributary to San Luis Obispo Creek, which discharges to the Pacific); intermittent. San Luis Obispo sheet.

Stenshaw Creek; Siskiyou County; rises in the southeastern part of T. 13 N., R. 6 E., Humboldt base and meridian; flows in general westward to its junction with Klamath River (tributary to the Pacific) near Stenshaws; length, 3 miles. Punnett's map of Siskiyou County.

Stenson Lagoon; Marin County; Punta de los Reyes. Punnett's map of Sonoma and Marin counties.

Stevens Creek; Santa Clara County; rises in the central part of T. 7 S., R. 3 W., Mount Diablo base and meridian, on the west slope of the Monte Bello Ridge, at altitude 2,000 feet above sea level; flows southeastward along the western base of the ridge, then turns abruptly and flows northeast and north to the tidal marsh at the southern end of San Francisco Bay; length, about 19 miles. Palo Alto sheet.

Stewart Creek; Mendocino County; rises in the southern part of T. 14 N., R. 16 W., Mount Diablo base and meridian; flows northwestward 1½ miles, then southwestward 1 mile, and enters the Pacific half a mile south of Bridgeport Landing. Punnett's map of Mendocino County.

Stewart Fork of Trinity River. *See* Trinity River, Stewart Fork.

Stoddard Canyon Creek; San Bernardino County; Santa Ana River basin; rises in the northwestern part of T. 1 N., R. 7 W., San Bernardino base and meridian, at altitude 5,750 feet above sea level; flows southwestward into San Antonio Canyon, through which it is tributary to Santa Ana River (tributary to the Pacific); length, 3 miles; fall, 3,300 feet. Cucamonga sheet.

Stokes Canyon Creek; Los Angeles County; an intermittent stream, 4 miles long, flowing southwestward into Las Virgenes Creek (tributary to Malibu Creek, which discharges to the Pacific). Camulos sheet.

Stone Canyon Creek; Ballona Creek basin; Los Angeles County; an intermittent stream, about 3 miles long, draining a small area in the Santa Monica Mountains and flowing southward into San Jose de Buenos Ayres Rancho. Santa Monica sheet.

Stone Corral Creek; Ventura County; an intermittent stream, 3½ miles long, rising in the northwestern part of T. 5 N., R. 19 W., San Bernardino base and meridian, and flowing north of west into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, about 2,000 feet. Tejon sheet.

Stone Creek; San Benito County; rises in the central part of T. 15 S., R. 6 E., Mount Diablo base and meridian; flows northwestward 2 miles, then in general south of east 6 miles to San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

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Stone Lagoon; Humboldt County; western part of T. 10 N., R. 1 E., Humboldt base and meridian; inlet, Laguna Creek. Punnett's map of Humboldt County.

Stony Creek; Del Norte County; rises in the southern part of T. 19 N., R. 3 E., Humboldt base and meridian; flows southwestward into North Fork of Smith River (tributary through Middle Fork of Smith to Smith River and thus to the Pacific); length, about 12 miles. Punnett's map of Del Norte County.

Stonybrook Canyon Creek; Alameda County; an intermittent stream, about 5 miles long, rising in the central part of T. 3 S., R. 1 W., Mount Diablo base and meridian, at altitude 1,350 feet above sea level, and flowing in general east of south to its junction with Alameda Creek (tributary to San Francisco Bay) in Alameda Canyon; fall, 1,200 feet. Pleasanton sheet.

Strawberry Creek; Alameda County; rises in the Berkeley Hills east of Berkeley; flows westward; enters San Francisco Bay at West Berkeley; length, about 4 miles; intermittent. Concord and San Francisco sheets.

Strawberry Creek; San Jacinto River basin; Riverside County; rises in the southwestern part of T. 4 S., R. 3 E., San Bernardino base and meridian, on south slope of Marion Mountain, at altitude 9,000 feet above sea level; flows southwestward into the South Fork of San Jacinto River; length, about 9 miles; fall, 6,500 feet. San Jacinto sheet.

Strawberry Creek; Santa Ana River basin; San Bernardino County; rises in the southwestern part of T. 2 N., R. 3 W., on the south slope of Strawberry Peak, at altitude 6,000 feet above sea level; flows southward 2½ miles, then south of west 1½ miles into East Twin Creek (tributary to Santa Ana River, which discharges to the Pacific); fall, about 4,100 feet. Redlands and San Bernardino sheets.

Strope Creek; Trinity County; rises in the northeastern part of T. 35 N., R. 9 W., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southeastward 4 miles to its junction with East Fork of Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); fall, 3,700 feet. Red Bluff sheet.

Stubby Canyon Creek; Riverside County; T. 2 S., R. 2 E., San Bernardino base and meridian; a stream, about 4 miles long, draining the eastern edge of the township and flowing southward to San Gorgonio Pass, which slopes eastward from a point near Beaumont to the Colorado Desert. San Jacinto sheet.

Suey Creek; San Luis Obispo County; an intermittent stream flowing southwestward into Santa Maria River (tributary to the Pacific) 2 miles northeast of the city of Santa Maria. Lompoc sheet.

Suisun Creek; Napa and Solano Counties; rises in the southeastern part of T. 7 N., R 3. W., Mount Diablo base and meridian, on the west slope of the Vaca Mountains, at altitude 900 feet above sea level; flows southward through Gordon Valley toward the tidal marsh on the north side of Suisun Bay. The map shows no direct connection between this creek and Suisun Creek, the channel in the tidal marsh on the north side of the bay extending southwestward from the town of Suisun. Napa sheet.

Sugar Creek; Siskiyou County; rises in the western part of T. 40 N., R. 9 W., Mount Diablo base and meridian, on the south slope of Mount of the Cross; flows north of east 5 miles, then northwestward 1 mile; sinks before reaching Scott River (tributary to Klamath River, which discharges to the Pacific), to which its basin is tributary. Punnett's map of Siskiyou County.

Sugarpine Creek; Trinity County; rises in the western part of T. 37 N., R. 8 W., Mount Diablo base and meridian; flows west of north 3 miles, then

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northeastward 1½ miles into Coffee Creek (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Sullivan Canyon Creek; Los Angeles County; an intermittent stream, about 5 miles long, draining a small area in the Santa Monica Mountains and flowing southeastward into Santa Monica Canyon, which discharges to the Pacific in Santa Monica Bay. Calabasas and Santa Monica sheets.

Sulphur Canyon Creek; Ventura County; an intermittent stream, 2 miles long, draining southward to Hammond Canyon Creek (tributary through Canada Larga to Ventura River, which discharges to the Pacific). Santa Paula sheet.

Sulphur Creek; Alameda Creek basin; Santa Clara County; rises in the northern part of Los Huecos Rancho, at altitude 3,650 feet above sea level; flows northwestward 1½ miles, then southwestward 2½ miles to its junction with Smith Creek (tributary through Arroyo Hondo to Calaveras Creek and thus to Alameda Creek, which discharges to San Francisco Bay); fall, 1,400 feet; drains the southern and eastern slopes of Mount Hamilton and Copernicus Peak, and the northern and eastern slope of Mount Isabel. Mount Hamilton sheet.

Sulphur Creek; Rincon Creek basin; Ventura County; an intermittent stream, 1½ miles long, rising on the west slope of La Granada Mountain in T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing southwestward to Rincon Creek (tributary to the Pacific). Ventura sheet.

Sulphur Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2½ miles long, rising in the north-central part of T. 5 N., R. 19 W., San Bernardino base and meridian, southeast of Whiteacre Peak, and flowing northeastward to Agua Blanca Creek (tributary through Piru Creek to Santa Clara River, which discharges to the Pacific); fall, about 2,200 feet. Tejon sheet.

Sulphur Creek, Big; Russian River basin; Sonoma County; rises on the west slope of the Coast Range in the southwestern part of T. 11 N., R. 8 W., Mount Diablo base and meridian; takes a general northwesterly course to its junction with Russian River (tributary to the Pacific) 1 mile north of Cloverdale; length, 14 miles; principal tributaries, Squaw Creek and South Fork. Punnett's map of Sonoma County.

Sulphur Creek, Big, South Fork; Russian River basin; Sonoma County; rises on the western slope of the Coast Range in the northern part of T. 10 N., R. 8 W., near Pine Flat; takes a general northwesterly course to its junction with Big Sulphur Creek through which it is tributary to Russian River (tributary to the Pacific); length, 12 miles; principal tributary, Little Sulphur Creek. Punnett's map of Sonoma County.

Sulphur Creek, Little; Sonoma County; rises in the eastern part of T. 11 N., R. 9 W., Mount Diablo base and meridian; flows north of west 5 miles to its junction with the South Fork of Big Sulphur Creek (tributary through Big Sulphur Creek to Russian River, which flows to the Pacific). Punnett's map of Sonoma County.

Sulphur Spring Canyon Creek; Santa Barbara County; rises in Santa Barbara Potrero, at altitude 5,000 feet above sea level; flows northwestward into Salisbury Canyon Creek (tributary to Cuyama River—Santa Maria River—which discharges to the Pacific); intermittent. Santa Ynez sheet.

Sulphur Spring Canyon Creek; Ventura County; an intermittent stream, 5 miles long, rising in the eastern part of T. 8 N., R. 23 W., San Bernardino base and meridian, at altitude 5,000 feet above sea level; flows west of south to Cuyama River (Santa Maria River, which discharges to the Pacific); fall, 1,100 feet. Mount Pinos sheet.

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Sulphur Spring Creek; Alameda Creek basin; Santa Clara County; an intermittent stream rising in the northern part of T. 6 S., R. 4 E., Mount Diablo base and meridian, and flowing southeastward toward the head of San Antonio Creek (tributary through Arroyo del Valle to Arroyo de la Laguna, and thus to Alameda Creek, which discharges to San Francisco Bay); the point of junction with San Antonio Creek or one of its headwaters is not shown on the map—Mount Hamilton sheet; the creek is not named on the Land Office map.

Sulphur Springs Creek; Napa River basin; Solano County; rises on the west slope of Sulphur Springs Mountain, at altitude 400 feet above sea level; flows north of west to Lake Chabot (altitude 77 feet), which discharges to Napa River; fall, about 300 feet. Napa sheet.

Sulphur Springs Valley Creek; Solano County; rises in the southern part of T. 4 N., R. 3 W., Mount Diablo base and meridian, on the north slope of Sulphur Springs Mountain, at altitude 600 feet above sea level; flows southeastward 8 miles and discharges into Suisun Bay just north of Benicia. Napa sheet.

Summers Creek; Mono County; rises in the central part of T. 3 N., R. 24 E., Mount Diablo base and meridian, on the north slope of Monument Ridge, at altitude 10,500 feet above sea level; flows northward 4 miles through Tamarack Canyon, then winds to the east, southeast and northeast to its point of junction with Green Creek (tributary through Virginia Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); length, about 10 miles; fall, 3,700 feet, of which 2,500 feet is made in the first 4 miles; passes through Tamarack Lake. Bridgeport sheet.

Summit Creek; Inyo County; rises on the east slope of the Sierras, 1 mile east of Olancha Pass, at altitude 8,500 feet above sea level; flows north of east 3 miles, then southeastward to the south end of Owens Valley, where its waters sink; fall, 4,100 feet. Olancha sheet.

Summit Lake; Mono County; northern part of T. 2 N., R. 24 E., Mount Diablo base and meridian; outlet, East Fork of Green Creek to Green Creek (tributary through Virginia Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); altitude, 10,203 feet. Bridgeport sheet.

Sun Creek; Klamath County, Oreg.; rises in springs south of Crater Lake; flows southeastward into Anna River (tributary to Upper Klamath Lake, which discharges through Klamath River to the Pacific). Ashland and Klamath sheets.

Supply Creek; Humboldt County; rises in the south-central part of T. 7 N., R. 4 E., Humboldt base and meridian; flows in general northeastward to its junction with Trinity River (tributary to Klamath River, which flows to the Pacific) near Hoopa in the Hoopa Valley Indian Reservation; length, about 7 miles. Punnett's map of Humboldt County.

Sur River, Big; Monterey County; a stream, about 15 miles long, discharging into the Pacific 2 miles southeast of Point Sur. Post route map of California, 1911.

Sur Creek, Little; Monterey County; a stream about 8 miles long, flowing northwestward, and entering the Pacific 2 miles north of Point Sur. Land Office map of California, 1907.

Surper Creek; Humboldt County; rises in the northwestern part of T. 11 N., R. 2 E., Humboldt base and meridian; flows south of east 2 miles, then northeastward 2 miles into Klamath River (tributary to the Pacific). Punnett's map of Humboldt County.

Surrender Creek; Mendocino County; rises in the central part of T. 15 N., R. 15 W.; Mount Diablo base and meridian; flows westward 2 miles, then northwestward 1½ miles into the North Fork of Navarro River (tributary through Navarro River to the Pacific). Punnett's map of Mendocino County.

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Susanna Canyon Creek; Los Angeles County; rises in the north-central part of T. 2 N., R. 9 W., San Bernardino base and meridian, at altitude 4,000 feet above sea level; takes a circuitous but in general southerly course into San Gabriel River; length, about 2½ miles; fall, 2,500 feet; intermittent. Rock Creek and Pomona sheets.

Susan River; Lassen County; rises in small lakes at altitude about 5,900 feet above sea level, north of Caribou Lake in the eastern part of T. 31 N., R. 7 E., Mount Diablo base and meridian; takes a general southeasterly course to the point at which it enters Honey Lake, of which it is the chief feeder; length, about 50 miles; fall, about 2,000 feet; principal tributaries, Willards, Williams, Bridge, Cheney, Piute, Gold Run, and Willow creeks.

Fifty per cent of the water entering the Honey Lake basin is believed to come from Susan River above Susanville. This portion of the basin is practically entirely timbered, the growth near the summit being dense and of a fine quality. The mean annual precipitation, as indicated by records kept at Susanville since 1885, is 22.20 inches. The river furnishes water for irrigation of meadows of native hay which are flooded by means of weirs built in the river assisted by levees.

Gaging station near Susanville (1900–1905).

Authorities.—Lassen Peak sheet (on which it is called Susan Creek), and Honey Lake sheet; Second Annual Report of the U. S. Reclamation Service, 1902–03, pp. 115–118.

Suscol Creek; Napa County; an intermittent stream rising in the southwestern part of T. 5 N., R. 3 W., Mount Diablo base and meridian, and flowing westward into Napa River (tributary to San Pablo Bay) near Thompson; length, about 4 miles. Napa sheet.

Sutton Canyon Creek; Carpinteria Creek basin; Santa Barbara County; rises on the southern slope of the Santa Ynez Mountains, at altitude 2,750 feet above sea level; flows southeastward 4½ miles into Carpinteria Creek; fall, 1,400 feet. Santa Barbara special and Ventura sheets.

Suzy Lake; Eldorado County; T. 12 N., R. 17 E., Mount Diablo base and meridian; inlet, from Halfmoon Lake; outlet, a stream 3 miles long, flowing southeast and north of east into Fallen Leaf Lake (tributary to Lake Tahoe); altitude, 7,750 feet; fall of outlet, 1,400 feet. Pyramid Peak sheet.

Swager Creek; Mono County; rises in the southern part of T. 7 N., R. 24 E., Mount Diablo base and meridian, at altitude 10,100 feet above sea level; flows east of south to its junction with Buckeye Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake) in Bridgeport Valley; length, 12 miles; fall, 3,600 feet; principal tributary, Long Valley Creek. Gaging station near Bridgeport (1911–12). Bridgeport sheet.

Swede Creek; Trinity County; rises in the southwestern part of T. 6 N., R. 8 E., Humboldt base and meridian; flows west of south about 4½ miles into Trinity River (tributary to Klamath River, which flows into the Pacific). Punnett's map of Trinity County.

Sweetwater Creek; California-Nevada; rises in Mono County, Cal., on the eastern slope of Sweetwater Mountains, at altitude 10,500 feet above sea level; flows northeastward 4 miles, then southeastward 7 miles to its junction with East Walker River (tributary to Walker River, which discharges to Walker Lake) in Mineral County, Nev.; fall, 4,200 feet, of which 3,000 feet is made in the 4 miles above Sweetwater Valley; principal tributary, Ferris Canyon Creek. Bridgeport sheet.

Sweetwater Reservoir; San Diego County; on Sweetwater River (tributary to the Pacific) 8 miles above its mouth, at altitude 145 feet above sea level.

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During the extremely dry period from 1898 to 1904 there were years when no water from Sweetwater River reached the reservoir. From 1899 to 1904 the reservoir was dry, and to tide over this period of drought pumping was resorted to. Wells were sunk in the reservoir site and pumps installed, by means of which water was delivered to the distribution system. Pumping operations were also extensively carried on in the valley along the river below the reservoir San Diego sheet; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 87–88.

Sweetwater River; San Diego County; rises on the south and east slope of Cuyamaca Mountains of the Coast Range; takes a general southwesterly course to the point at which it enters the Pacific through San Diego Bay south of National City; length, about 45 miles; drainage area, approximately 215 square miles.

The basin, which lies directly south of San Diego River and north of the Otay and Cottonwood creek basins, is extremely narrow. The topography is not so rough as that of the San Diego River basin, although the mountains and foothills extend within 3 or 4 miles of the shore line of San Diego Bay.

A considerable area of land between the bay and the foothills south of National City is highly cultivated, the greater part of the land being irrigated by water taken from Sweetwater River. The basin is poorly forested; the timber is confined almost entirely to the valleys of the streams and to the higher mountain areas. The mountain slopes are fairly well covered with brush but the lower foothills are almost bare.

The mean annual rainfall ranges from 10 to 15 inches along the foothill belt and from 20 to 40 inches in the mountains.

The celebrated Sweetwater dam is on Sweetwater River about 8 miles above its mouth at elevation 145 feet above sea level. There are two other reservoir sites on Sweetwater River, one a short distance above Dehesa post-office and the other below Descanso.

Gaging station near Descanso (1905–1912).

Authorities: Cuyamaca and San Diego sheets; Water-Supply Paper U. S. Geol. Survey No. 271, 1911, pp. 87–88.

Sweetwater River, North Fork; San Diego County; rises in the northern part of T. 16 S., R 2 E., San Bernardino base and meridian, at altitude 1,500 feet above sea level; flows north of west 2 miles, then southwestward 3 miles into Sweetwater River (tributary to the Pacific through San Diego Bay) near Dehesa; fall, about 900 feet; intermittent. Cuyamaca sheet.

Swift Creek; Trinity County; rises in the central part of T. 37 N., R. 9 W., Mount Diablo base and meridian, at altitude 6,000 feet above sea level; flows southeastward 8 miles, then to the east and northeast 7 miles, then again southeastward 1 mile to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific) in the central part of T. 36 N., R. 7 W.; length, 16 miles; fall, 3,700 feet, of which 1,000 feet is made in the first 2 miles. Gaging station near Trinity Center (1910–1912). Shasta and Red Bluff sheets.

Sycamore Canyon Creek; Los Angeles River basin; Los Angeles County; an intermittent stream, 2 miles long, rising in the San Rafael Hills and flowing southwestward toward Los Angeles River (tributary to the Pacific); reaches the edge of the valley 1 mile northeast of Glendale. Pasadena sheet.

Sycamore Canyon Creek; Otay River basin; San Diego County; rises in the northern part of T. 18 S., R. 2 E., San Bernardino base and meridian, at altitude 1,500 feet above sea level; flows northwestward into Dulzura Creek (tributary through Jamul Creek to lower Otay reservoir); length, 3 miles; fall, about 750 feet; intermittent. Cuyamaca sheet.

Sycamore Canyon Creek; San Diego River basin; San Diego County; rises in central part of T. 14 S., R. 1 W., San Bernardino base and meridian, at

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altitude 1,200 feet above sea level; flows somewhat west of south to its junction with San Diego River, which discharges to the Pacific through False Bay; intermittent; length, 8 miles; fall, 900 feet; principal tributaries, West Sycamore Canyon and Quail Canyon creeks. Elcajon and La Jolla sheets.

Sycamore Canyon Creek; San Luis Obispo Creek basin; San Luis Obispo County; an intermittent stream, rising in the San Luis Range, in the eastern part of Canada de Los Osos Rancho, and flowing south of east into a lake in Laguna Rancho, 1½ miles southwest of San Luis Obispo; the lake discharges by a southeastward-flowing stream to San Luis Obispo Creek (tributary to the Pacific). San Luis Obispo sheet.

Sycamore Canyon Creek; Santa Barbara County; an intermittent stream, 4 miles long, rising in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains, at altitude 1,750 feet above sea level, and flowing southward into the Pacific Ocean just east of Santa Barbara. Santa Barbara special sheet.

Sycamore Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 1½ miles long, rising in the eastern part of T. 6 N., R. 20 W., San Bernardino base and meridian, and flowing southeastward into Alder Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Sycamore Canyon Creek; Ventura County; an intermittent stream, about 8 miles long, rising in El Canejo Rancho, 1 mile northwest of Sandstone Peak, and flowing southwesterly into the Pacific Ocean. Camulos and Hueneme sheets.

Sycamore Canyon Creek, Little; San Diego County; rises in western part of Elcajon Rancho, at altitude 650 feet above sea level; flows southward into San Diego River, which discharges to the Pacific through False Bay; length, 2 miles; fall, 350 feet. La Jolla sheet.

Sycamore Canyon Creek, Little; Ventura County; rises in the northeastern part of T. 1 S., R. 20 W., 2 miles west of Triunfo Pass; flows southwestward 4 miles into the Pacific Ocean. Camulos sheet.

Sycamore Canyon Creek, West; San Diego County; rises in the southwestern part of T. 14 S., R. 1 W., San Bernardino base and meridian, at altitude 900 feet above sea level; flows southerly 3½ miles into Sycamore Canyon Creek (tributary to San Diego River, which discharges to the Pacific through False Bay); intermittent; fall, 500 feet. La Jolla sheet.

Sycamore Creek; Santa Clara River basin; Ventura County; an intermittent stream, 2½ miles long, rising in the eastern part of T. 6 N., R. 21 W., San Bernardino base and meridian, and flowing southward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific) at Ten Sycamore Flat. Mount Pinos sheet.

Sycamore Creek; Walnut Creek basin; Contra Costa County; rises in the eastern part of T. 1 S., R 1 W., Mount Diablo base and meridian, on the south slope of the Black Hills, at altitude of 1,150 feet above sea level; flows west of south 3 miles, then northwestward through Sycamore Valley to San Ramon Creek (Walnut Creek) in San Ramon Valley; length, about 6½ miles; fall, 750 feet. Mount Diablo sheet.

Sycan River; Klamath County, Oreg.; rises in Sycan Marsh; flows southwestward about 12 miles, then east of south about 15 miles into Sprague River (tributary through Williamson River to Upper Klamath Lake and thus to Klamath River, which discharges to the Pacific); principal tributary, Long Creek. Klamath sheet.

Symmes Creek; Inyo County; Inyo National Forest; rises on the east slope of the Sierra, 1½ miles southeast of Mount Bradley, at altitude 10,500 feet above

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sea level; flows northeastward 10 miles to the edge of Owens Valley, where its waters sink; fall, 6,500 feet, of which 4,700 feet occurs in the first 4 miles. Mount Whitney sheet.

Taboose Creek; Inyo County; Inyo National Forest; rises on the east slope of the Sierra in Taboose Pass, at altitude 11,400 feet above sea level; flows northeastward 5 miles and southeastward 5 miles to the edge of Owens Valley, where its waters sink; fall, 7,500 feet. Gaging station near Aberdeen (1906–1911). Mount Whitney and Bishop sheets.

Tahchevah Creek; Riverside County; T. 4 S., R. 4 E.; San Bernardino base and meridian; a stream about 2 miles long, flowing northeastward into Colorado Desert near Palm Springs. San Jacinto sheet.

Tahoe Lake; Placer and Eldorado counties, Cal., Washoe, Ormsby, and Douglas counties, Nev., about three-fourths of the lake is in California; principal inflowing streams, Upper Truckee River, Meeks, General, McKinney, Madden, Blackwood, and Ward creeks; outlet, Truckee River, which leaves the lake through a magnificent gorge at a point on its northwestern shore and discharges into Pyramid and Winnemucca lakes, Nev.; area, 193 square miles; altitude, 6,225 feet; noted as the largest body of fresh water in the United States at so high an altitude. Gaging station at Tahoe (1900–1912). Truckee, Pyramid Peak, Carson, and Markleeville sheets; Water-Supply Paper U. S. Geol. Survey No. 290, 1912, p. 180.

Tahquitz Canyon; Riverside County; a drainage way, about 1 mile long, opening southward to Martinez Canyon, which discharges to the Colorado Desert. Indio special sheet.

Tahquitz Creek; Riverside County; rises in the northern part of T. 5 S., R. 3 E., San Bernardino base and meridian, at altitude 8,400 feet above sea level; flows northeastward to the Agua Caliente Indian Reservation, where its waters sink; length, about 8 miles; fall, 7,900 feet. San Jacinto sheet.

Tajiguas Creek; Santa Barbara County; an intermittent stream, rising in the Santa Barbara National Forest on the south slope of the Santa Ynez Mountains, at altitude 1,700 feet above sea level, and flowing southward into the Pacific near Tajiguas; length, about 4 miles. Lompoc sheet.

Talega Canyon Creek; Riverside and San Diego counties; rises in the southwestern part of Riverside County at altitude 2,000 feet above sea level; flows southwesterly 10 miles into Cristianitos Canyon Creek, which discharges into San Mateo Creek (tributary to the Pacific); fall, 1,800 feet; intermittent. Elsinore, San Luis Rey, and Capistrano sheets.

Taley Creek; Humboldt County; rises in the southwestern part of T. 9 N., R. 3 E., Humboldt base and meridian, on Bear Mountain; flows northeastward 8 miles to its junction with Klamath River (tributary to the Pacific). Punnett's map of Humboldt County.

Talowa Creek; Del Norte County; rises in the eastern part of T. 17 N., R. 1 W., Humboldt base and meridian; flows northwestward into the northern arm of Lake Earl. Punnett's map of Del Norte County (on which it is not named); Land Office map of California, 1907.

Talowa Lake; Del Norte County; the western arm of Lake Earl (q. v.).

Tamarack Lake; Mono County; north-central part of T. 3 N., R. 24 E., Mount Diablo base and meridian; inlet, Summers Creek; outlet, Summers Creek to Green Creek (tributary through Virginia Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); altitude, 10,150 feet. Bridgeport sheet.

Tapo Canyon Creek; Calleguas Creek basin; Ventura County; rises on the south slope of Oak Ridge, at altitude about 2,500 feet above sea level; flows

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southerly into Simi Valley, where it joins Arroyo Simi (Calleguas Creek, which discharges to the Pacific); intermittent; fall above mouth of canyon, about 1,500 feet. Camulos and Santa Susana sheets.

Tapo Canyon Creek; Santa Clara River basin; Ventura County; rises on the north slope of Oak Ridge, opposite the head of the Tapo Canyon Creek which flows southward to Simi Valley, at altitude 2,500 feet above sea level; flows northerly to its junction with Santa Clara River (tributary to the Pacific); length, about 3½ miles; fall, 1,750 feet. Santa Susana sheet.

Tar Creek; Ventura County; rises on the north slope of Hopper Mountain in the Santa Barbara National Forest, at altitude 2,800 feet above sea level; flows westward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, 4 miles; fall, 1,700 feet; principal tributaries, North Fork and Red Rock creeks. Tejon and Camulos sheets.

Tar Creek, North Fork; Ventura County; an intermittent stream, 2 miles long, rising in the central part of T. 5 N., R. 19 W., San Bernardino base and meridian, and flowing southwestward into Tar Creek (tributary through Sespe Creek to Santa Clara River, which discharges to the Pacific). Tejon and Camulos sheets.

Tarraville Creek; Alameda Creek basin; Alameda County; an intermittent stream, about 2½ miles long, rising in the eastern part of T. 5 S., R. 4 E., Mount Diablo base and meridian, and flowing northeastward to Arroyo Mocho (tributary through Arroyo las Positas to Arroyo de la Laguna and thus to Alameda Creek, which discharges to San Francisco Bay). Mount Hamilton sheet.

Tar Spring Creek; San Luis Obispo County; an intermittent stream flowing westward to Arroyo Grande Creek in Santa Manuela Rancho. Arroyo Grande sheet.

Tassajero Creek; Alameda Creek basin; Contra Costa and Alameda counties; rises in Contra Costa County, in the north-central part of T. 1 S., R. 1 E., Mount Diablo base and meridian, on the eastern slope of Windy Point, at altitude 1,750 feet above sea level; flows in general somewhat west of south to Amador Valley, where it joins Arroyo de la Laguna (tributary through Alameda Creek to San Francisco Bay); length, about 15 miles; fall, 1,450 feet. Mount Diablo and Pleasanton sheets.

Taylor Canyon Creek; Santa Ynez River basin; San Luis Obispo County; an intermittent stream, 6 miles long, rising in the eastern part of T. 32 S., R. 19 E., Mount Diablo base and meridian, and flowing southwestward into Cuyama River (Santa Maria River, which discharges to the Pacific); tributary, Redrock Canyon Creek. McKittrick sheet.

Taylor Canyon Creek; Walker River basin; Mono County; rises in the northwestern part of T. 7 N., R. 23 E., Mount Diablo base and meridian, at altitude 7,000 feet above sea level; flows northward into Lost Canyon Creek (tributary through West Walker River to Walker River, which discharges to Walker Lake); fall, 1,400 feet. Bridgeport sheet.

Taylor Creek; Siskiyou County; rises in the northeastern part of T. 40 N., R. 10 W., Mount Diablo base and meridian, on the west slope of Salmon Mountains; flows westward to its junction with Russian Creek (tributary through North Fork of Salmon River to Salmon River and thus to the Klamath, which discharges to the Pacific); length, 4 miles. Punnett's map of Siskiyou County.

Tbrup Creek; Humboldt and Del Norte counties; rises in Humboldt County in the northwestern part of T. 12 N., R. 2 E.; flows east of north 3 miles and unites with Klamath River (tributary to the Pacific) in Del Norte County. Punnett's map of Del Norte County.

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Tecolote Canyon Creek; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 2,400 feet above sea level; flows somewhat west of south 6 miles to the point at which it enters the Pacific, 2 miles west of Elwood; intermittent in part of course. Goleta special sheet.

Tecolote Valley Creek; San Diego County; rises in the eastern part of the Pueblo Lands of San Diego, at altitude 350 feet above sea level; flows northwestward and southwestward about 1 mile, southeastward 3 miles, then irregularly westward 2 miles to False Bay through which it enters the Pacific; intermittent. La Jolla sheet.

Tecopa Dry Lake; Inyo County; southeast of Resting Springs; dry except after heavy rain. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I.

Teetah Creek; Humboldt County; rises in the south-central part of T. 10 N., R. 2 E., Humboldt base and meridian; flows in general east of north to its junction with Klamath River (tributary to the Pacific); length, about 10 miles. Punnett's map of Humboldt County.

Telegraph Canyon Creek; San Diego County; rises in the southern part of T. 17 S., R. 1 W., San Bernardino base and meridian, at altitude 500 feet above sea level; flows in general southwestward to San Diego Bay; length, about 8½ miles; intermittent. Cuyamaca and San Diego sheets.

Temecula Creek; Temecula River. *See* Santa Margarita River.

Temescal Canyon Creek; Los Angeles County; an intermittent stream, about 5 miles long, draining a small area in the Santa Monica Mountains and flowing southward toward Santa Monica Bay into which its flood discharge may pass. Calabasas sheet.

Temescal Creek; Alameda County; rises in the Berkeley Hills, just west of Temescal Lake; flows southwestward into San Francisco Bay; intermittent. Concord and San Francisco sheets.

Temescal Creek; San Dieguito River basin; San Diego County; rises in the eastern part of T. 11 S., R. 1 E., San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows somewhat west of south 9 miles to its junction with Santa Ysabel Creek (San Dieguito River); intermittent; fall, 2,100 feet; passes through Temescal Valley at its head and Pamo Valley at its mouth. Ramona sheet.

Temescal Creek; Santa Ana River basin; Riverside County; rises in the southeastern part of T. 5 S., R. 5 W., San Bernardino base and meridian, north of Elsinore Lake, at altitude about 1,300 feet above sea level; flows northwestward into Santa Ana River (tributary to the Pacific); length, about 22 miles; fall, 800 feet; the direct drainage area of the creek comprises about 92 square miles and is untimbered; the creek is said, however, to be fed to some extent by subterranean percolation from other basins, and it possibly thus receives addition to its summer waters from Lake Elsinore, which lies on the plateau above and the drainage area of which extends to the distant San Jacinto Mountains. The flood waters of the lake flow over into the Temescal but by no means each year. Elsinore and Corona sheets; Irrigation in southern California, by Wm. Ham Hall, Sacramento, 1888, pp. 121–122.

Temescal Lake; Alameda County; northeast of Oakland; two inflowing streams. The map shows no surface connection between Temescal Creek and Temescal Lake. Concord sheet.

Tenaja Canyon Creek; San Diego and Riverside counties; rises on El Potrero del Tenaja, at altitude 2,000 feet above sea level; flows northwestward 3½ miles into San Mateo Creek; fall, about 900 feet; intermittent. Elsinore sheet.

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Tenmile River; Mendocino County; rises in the northern part of T. 19 N., R. 15 W., Mount Diablo base and meridian; flows in general somewhat north of west to the point at which it enters the Pacific 2 miles south of Newport, in the southwestern part of T. 20 N., R. 17 W.; length, including major windings, 16 miles; principal tributaries, North Fork and South Fork. Punnett's map of Mendocino County.

Tenmile River, North Fork; Mendocino County; rises in the central part of T. 20 N., R. 15 W., Mount Diablo base and meridian; flows northwestward to the northern part of T. 20 N., R. 16 W., then southwestward and southward to its junction with Tenmile River (tributary to the Pacific) in the eastern part of T. 20 N., R. 17 W.; length, including major windings, 12 miles. Punnett's map of Mendocino County.

Tenmile River, South Fork; Mendocino County; rises in the northern part of T. 19 N., R. 15 W., Mount Diablo base and meridian; flows southwestward 4 miles into the southeastern part of T. 19 N., R. 16 W., then west and northwest 11 miles to its junction with Tenmile River on the boundary between Tps. 19 and 20 N., R. 17 W.; principal tributaries, Redwood Creek, North Fork of South Fork, and Smith Creek. Punnett's map of Mendocino County.

Tenmile River, South Fork, North Fork of; Mendocino County; rises in the central part of T. 19 N., R. 16 W., Mount Diablo base and meridian; flows westward to its junction with South Fork of Tenmile River (tributary through Tenmile River to the Pacific); length, 5 miles. Punnett's map of Mendocino County.

Tepusquet Creek; Santa Barbara County; rises in the San Rafael Mountains, on the east slope of Los Coches Mountain, at altitude 1,900 feet above sea level; flows southerly to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific); length, about 9 miles; fall, 1,400 feet; principal tributary, Colson Fork; intermittent. Lompoc sheet.

Tequepis Canyon Creek; Santa Barbara County; an intermittent stream, 3½ miles long, rising on the north slope of Santa Ynez Peak, at altitude 3,200 feet above sea level, and flowing east of north to Santa Ynez River (tributary to the Pacific). Santa Ynez sheet.

Tequisquita Slough; Pajaro River basin; San Benito County; rises in the western part of T. 12 S., R. 7 E., Mount Diablo base and meridian; flows westward and northwestward and joins Pacheco Creek (tributary to Pajaro River, which discharges to the Pacific in Monterey Bay), in the western part of T. 11 S., R. 5 E.; length, about 20 miles; tributary, Cienega Creek. Land Office map of California, 1907.

Terwah Creek; Del Norte County; rises in the southwestern part of T. 15 N., R. 2 E., Humboldt base and meridian; flows southeastward 4 miles, then west of south 6 miles to its junction with Klamath River (tributary to the Pacific). Punnett's map of Del Norte County.

Texas Canyon Creek; Los Angeles County; a drainage way in the central part of T. 5 N., R. 15 W., San Bernardino base and meridian, opening westward into Deadman Canyon which discharges to Santa Clara River (tributary to the Pacific). Fernando sheet.

Thatcher Creek; Mendocino County; rises in the central part of T. 21 N., R. 10 W., Mount Diablo base and meridian; takes a general westerly course to its junction with Middle Fork of Eel River (tributary to Eel River, which flows to the Pacific); length, about 8 miles. Punnett's map of Mendocino County.

Thibaut Creek; Inyo County, Inyo National Forest; rises about 1 mile east of Mount Baxter, at altitude 11,000 feet above sea level; flows south of east 2½ miles and northeastward 3 miles into Owens Valley, where its waters sink; fall,

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7,000 feet. Gaging station near Independence (1907-1909). Mount Whitney sheet.

Thompson Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 19 N., R. 7 E., Humboldt base and meridian; flows in general southeastward to its junction with Klamath River (tributary to the Pacific); length, about 12 miles. Punnett's map of Siskiyou County.

Thompson Creek; Klamath River basin; Siskiyou County; rises in the western part of T. 45 N., R. 11 W., Mount Diablo base and meridian, on the eastern slope of Marble Mountains; flows southeastward 7 miles to its junction with Scott River (tributary to Klamath River, which flows to the Pacific). Punnett's map of Siskiyou County.

Thompson Creek; Pajaro River basin; San Benito County; rises in southern part of T. 14 S., R. 5 E., Mount Diablo base and meridian; flows north of east into Pescadero Creek, through which it is tributary to San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 5 miles. Land Office map of California, 1907.

Thompson Creek; Santa Ana River basin; Los Angeles County; rises in the east-central part of T. 1 N., R. 8 W., San Bernardino base and meridian, at altitude 4,000 feet above sea level; flows southerly and southwesterly to the edge of Cucamonga Plain; length, about 8 miles; fall, 2,750 feet; intermittent. Cucamonga sheet.

Thousand Palms Canyon Creek; San Diego County; an intermittent stream, 4 miles long, flowing easterly into Collins Valley, which is drained by Coyote Creek to Borego Valley, in the Colorado Desert. Ramona and Indio special sheets.

Threemile Creek; Klamath County, Oreg.; rises in the western part of the county, 4 miles south of the head of Sevenmile Creek; flows eastward and southward into Cherry Creek (tributary to Sevenmile Creek, which discharges through Upper Klamath Lake to Klamath River, which flows to the Pacific); length, 8 miles. Ashland sheet.

Three Sisters Dry Lake; Kern County; Tps. 8 and 9 N., R. 11 W., San Bernardino base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I. Called Buckhorn Dry Lake in Water-Supply Paper 278, 1911, p. 14, Pl. VI.

Tick Canyon Creek; Los Angeles County; rises in the central part of T. 5 N., R. 14 W., San Bernardino base and meridian, at altitude 2,650 feet above sea level; flows southwestward into Santa Clara River (tributary to the Pacific); length, about 6 miles; fall, 1,000 feet; intermittent. Fernando sheet.

Tice Valley Creek; Contra Costa County; rises in the eastern part of T. 1 S., R. 2 W., Mount Diablo base and meridian, 1 mile north of Las Trampas Peak, at altitude 800 feet above sea level; flows northwestward 2½ miles, then east and north 2½ miles into Lafayette Branch of Walnut Creek (tributary through Walnut Creek to Suisun Bay) near the town of Walnut Creek; fall, 650 feet. Concord sheet.

Tillman Lake; Shasta County; southeastern part of T. 31 N., R. 5 E., Mount Diablo base and meridian, 6 miles north of east from Lassen Peak; neither inlet nor outlet shown on map; altitude, 7,300 feet above sea level. Lassen Peak sheet.

Timber Canyon Creek; Ventura County; an intermittent stream, about 4 miles long rising on the south slope of Santa Paula Peak, in T. 4 N., R. 20 W., San Bernardino base and meridian, and flowing southward toward Santa Clara River (tributary to the Pacific). Santa Paula sheet.

Timber Creek; Ventura County; rises in the central part of T. 5 N., R. 21 W., San Bernardino base and meridian, on the north slope of Topatopa Mountains,

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at altitude 5,500 feet above sea level; flows northeastward 3 miles, then west and north 2 miles into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); fall, 2,800 feet. Mount Pinos sheet.

Tinemaha Creek; Inyo County; Inyo National Forest; rises on the east slope of the Sierra opposite the head of the South Fork of Kings River, at altitude 12,800 feet above sea level; flows easterly to the west base of Poverty Hills whence its course is northward to the edge of Owens Valley near Fish Springs; fall above the edge of the valley, about 8,800 feet, of which 5,800 feet is made in the first 4 miles; principal tributary, Red Mountain Creek. Gaging station near Tinemaha (1906–1911). Bishop sheet.

Tin Mine Canyon Creek; Riverside County; Santa Ana River basin; an intermittent stream, 2 miles long, flowing north of east to Hagador Canyon Creek, which discharges to the valley of Temescal Wash. Corona sheet.

Tinta Creek; Santa Barbara and Ventura counties; rises 2½ miles west of Cuyama Peak in the Santa Barbara National Forest, at altitude 5,200 feet above sea level; flows southeastward into Rancho Nuevo Creek, which discharges to Cuyama River (Santa Maria River, which discharges to the Pacific); length, about 8 miles; fall, 1,800 feet. Santa Ynez and Mount Pinos sheets.

Tioga Lake; Mono County; Mono National Forest; western part of T. 1 N., R. 25 E., Mount Diablo base and meridian; inlet, Glacier Canyon Creek, which flows through the lake to its junction with Leevining Creek (tributary to Mono Lake); altitude, 9,650 feet. Mount Lyell sheet.

Tish-Tang-a-Tang Creek; Humboldt County; rises in the eastern part of T. 8 N., R. 6 E., Humboldt base and meridian, on the west slope of Trinity Mountains; flows in general south of west to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific) in the southern part of Hoopa Valley Indian Reservation; length, about 11 miles. Punnett's map of Humboldt County.

Titus Creek; Siskiyou County; rises in the central part of T. 15 N., R. 7 E., Humboldt base and meridian; flows southwestward to its junction with Klamath River (tributary to the Pacific); length, 4 miles. Punnett's map of Siskiyou County.

Tom Lynch Creek; Monterey County; rises in the southwestern part of T. 21 S., R. 12 E., Mount Diablo base and meridian; flows southwestward about 10 miles to the valley of Salinas River, which discharges to the Pacific in Monterey Bay. Land Office map of California, 1907.

Tomales Creek; Marin County; rises in Rancho Bolsa de Tomales; flows northeastward 1 mile, northwestward 1 mile, then in general westward to the point at which it enters the Pacific; length, about 12 miles. Punnett's map of Marin County.

Tonki Creek; Mendocino County; rises in the southwestern part of T. 20 N., R. 13 W., Mount Diablo base and meridian; flows in general southeastward 13 miles, then to the east and northeast 6 miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Mendocino County.

Topanga Canyon Creek; Los Angeles County; an intermittent stream, about 9 miles long, rising in the southern part of T. 1 N., R. 17 W., San Bernardino base and meridian, and flowing southeastward to the Pacific Ocean about 5 miles northwest of Santa Monica; principal tributary, Garapito Creek. Calabasas sheet.

Toro Canyon Creek; Riverside County; an intermittent stream, about 2 miles long, flowing northeastward into the Colorado Desert. Indio special sheet.

Toro Canyon Creek; Santa Barbara County; rises on the south slope of the Santa Ynez Mountains, in T. 4 N., R 26 W., San Bernardino base and meridian,

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at altitude 2,750 feet above sea level; flows southwesterly, and enters the Pacific at Leon Point; intermittent. Santa Barbara special map.

Toro Creek; Salinas River basin; Monterey County; a stream, about 3 miles long, flowing northeastward into Salinas River (which discharges to the Pacific in Monterey Bay) 2½ miles northwest of Spreckels. Salinas Valley map, sheet 1.

Toro Creek; San Luis Obispo County; rises in the Santa Lucia Range, in the northwestern part of Asuncion Rancho, at altitude 1,250 feet above sea level; flows southeastward 2 miles, then southwestward 7 miles to the Pacific in Estero Bay; principal tributary, Smith Creek. Cayucos sheet.

Toroges Creek; Alameda County; a stream, about 4½ miles long, rising 1 mile northwest of Monument Peak, at altitude 2,300 feet above sea level; flows southwestward to the channel of Penitencia Creek (tributary to Coyote River) in the tidal marsh through which the river enters San Francisco Bay. San Jose sheet.

Torrey Canyon; Ventura County; a drainage way opening northward to Santa Clara River (tributary to the Pacific) 2 miles south of Piru. Camulos sheet.

Tosquin Creek; San Benito County; rises in southeastern part of T. 12 S., R. 7 E., Mount Diablo base and meridian; flows southward about 10 miles, then south of west 4 miles into Rosario Creek, through which it is tributary to San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

Towsley Canyon Creek; Los Angeles County; an intermittent stream rising on the northern slope of the Santa Susana Mountains, in T. 3 N., Rs. 16 and 17 W., San Bernardino base and meridian, and flowing northeastward to Wiley Canyon Creek, which discharges toward Santa Clara River (tributary to the Pacific) between Placerita and Pico Canyon creeks. Santa Susana sheet.

Trail Canyon Creek; Los Angeles River basin; Los Angeles County; rises on the south slope of Iron Mountain, at altitude 4,500 feet above sea level; flows southwestward and southward into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); length, about 4 miles; fall, 2,850 feet. Tujunga and Fernando sheets.

Trail Canyon; Ventura County; a drainage way, about 1 mile long, extending southeastward from Bear Mountain to Piru Creek (tributary to Santa Clara River, which discharges to the Pacific) at Castac Mine. Tejon sheet.

Trail Fork, San Gabriel River. *See* San Gabriel River, Trail Fork.

Trancas Canyon Creek; Los Angeles County; rises on the southern slope of the Santa Monica Mountains, in T. 1 S., R. 19 W.; flows east of south 5 miles into the Pacific Ocean. Camulos sheet.

Trinitas Creek; San Mateo County; rises 1½ miles northwest of Sierra Morena in Canada Verde y Arroyo de la Purisima Rancho, at altitude 1,500 feet above sea level; flows southwestward into the Pacific 2½ miles north of the mouth of San Gregorio Creek; tributary, Dry Creek. Santa Cruz sheet.

Trinity River; Trinity and Humboldt counties; rises in the northern part of T. 40 N., R. 6 W., Mount Diablo base and meridian, on the south slope of Scott Mountains, at altitude 6,000 feet above sea level; flows southwestward about 60 miles to the northeastern part of T. 32 N., R. 10 W., whence its general course is northwestward 68 miles to the northern part of T. 9 N., R. 4 E., Humboldt base and meridian, where it joins Klamath River. The drainage basin comprises nearly all of Trinity County and a small area in the northeastern part of Humboldt County. The river has many tributaries, the most important being East Fork, Stewart Fork, North Fork, New River, and South

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Fork. Gaging stations near Trinity Center (1910–1912), at Lewiston (1910–1912), near China Flat (1911–12) and at Hoopa (1911–12). Shasta and Red Bluff sheets; Punnett's maps of Trinity and Humboldt counties.

Trinity River, East Fork; Trinity County; rises in the western part of T. 38 N., R. 5 W., Mount Diablo base and meridian, on the west slope of Trinity Mountains, at altitude about 6,600 feet above sea level; takes a general southwesterly course to its junction with Trinity River (tributary to Klamath River, which flows to the Pacific) in the central part of T. 36 N., R. 7 W.; length, about 18 miles; fall, 4,300 feet; principal tributaries, Crow Creek, North Fork of East Fork, Cedar, Halls, and Squirrel Gulch creeks. Gaging station near Trinity Center (1910–1912). Shasta sheet; Punnett's map of Trinity County.

Trinity River, East Fork, North Fork of; Trinity County; rises in the southeastern part of T. 39 N., R. 6 W., Mount Diablo base and meridian, in a small lake on the western slope of Trinity Mountains, at altitude about 6,000 feet above sea level; flows somewhat north of west 3 miles, then southward 5 miles to its junction with the East Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); fall, 2,500 feet. Shasta sheet (on which it is not named); Punnett's map of Trinity County.

Trinity River, East Fork of North Fork, East Branch of; Trinity County; rises in the southeastern part of T. 36 N., R. 11 W., Mount Diablo base and meridian; flows southwestward 5 miles to its junction with the East Fork of North Fork of Trinity River (tributary through North Fork of Trinity to Trinity and thus to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Trinity River, North Fork; Trinity County; rises in the western part of T. 37 N., R. 11 W., Mount Diablo base and meridian, on the south slope of New River Mountains; flows in general somewhat east of south to the southern part of T. 34 N., R. 11 W., where it enters Trinity River (tributary to Klamath River, which discharges to the Pacific); length, 22 miles; principal tributaries, Grizzly, Rattlesnake, Whites, North Fork Gulch, and East Fork of North Fork. Gaging station at Helena (1911–12). Punnett's map of Trinity County.

Trinity River, North Fork, East Fork of; Trinity County; rises in the northwestern part of T. 35 N., R. 11 W., Mount Diablo base and meridian; flows southward 10 miles to its junction with North Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific); principal tributaries, East Branch, Yellow Jacket Creek, and Indian Gulch Creek. Punnett's map of Trinity County.

Trinity River, North Fork Gulch; Trinity County; rises in the central part of T. 34 N., R. 12 W., Mount Diablo base and meridian; flows northward 1½ miles, then south of east 2½ miles to its junction with North Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Trinity River, South Fork; Trinity and Humboldt counties; rises in Trinity County in the southern part of T. 27 N., R. 11 W., Mount Diablo base and meridian; takes a general northwesterly course to the central part of T. 6 N., R. 5 E., Humboldt base and meridian, where it unites with Trinity River (tributary to Klamath River, which discharges to the Pacific); length, including major windings, about 75 miles; principal tributaries, Prospect, Red Mountain, Smoky, Rattlesnake, Indian Valley, and Grouse creeks, and Hayfork River. Of these the only one entering from the west (left) side is Grouse Creek. Gaging station near China Flat (1911–12). Punnett's map of Trinity County.

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Trinity River, Stewart Fork; Trinity County; rises in the northern part of T. 36 N., R. 10 W., Mount Diablo base and meridian, in Smith Lake; flows eastward 2 miles, then southeastward 18 miles to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific); fall, about 4,100 feet; principal tributaries, Deer, Deep, Owen, Van Matre, and Buckeye creeks, and East Fork of Stewart. Shasta and Red Bluff sheets; Punnett's map of Trinity County.

Trinity River, Stewart Fork, East Fork of; Trinity County; rises in the southeastern part of T. 36 N., R. 9 W., Mount Diablo base and meridian, at altitude 6,800 feet above sea level; flows southeastward 5 miles, then in general somewhat west of south 6 miles to its junction with Stewart Fork (tributary through Trinity River to Klamath River, which discharges to the Pacific); fall, 4,800 feet. Red Bluff sheet.

Triunfo Creek; Ventura County; rises 1 mile north of Triunfo Pass, on Sandstone Peak (altitude, 3,059 feet); takes a very irregular but in general southeasterly course to the northeastern part of T. 1 S., R. 18 W., San Bernardino base and meridian, where it unites with Las Virgenes Creek to form Malibu Creek (tributary to the Pacific); length above point of junction, about 16 miles. Gaging station near Calabasas (1903–1906). See Malibu Creek. Camulos and Calabasas sheets.

Trout Creek; Alameda Creek basin; Alameda County; rises in the northwestern part of T. 5 S., R. 3 E., Mount Diablo base and meridian, on the north slope of Wauhab Ridge, at altitude 3,550 feet above sea level; flows southeastward 2½ miles, then north of east 1½ miles into Arroyo del Valle (tributary through Arroyo de la Laguna to Alameda Creek, which discharges to San Francisco Bay); fall, about 2,400 feet; tributary, Shafer Creek. Tesla sheet.

Trout Creek; Guadalupe River basin; Santa Clara County; a small stream rising in the western part of T. 8 S., R. 1 W., Mount Diablo base and meridian, and flowing southeastward toward San Tomas Aquinas Creek (tributary through Campbell Creek to Guadalupe River, which discharges to San Francisco Bay). The creek is not named on the Land Office Map and its point of junction with San Tomas Aquinas Creek is not shown on the Santa Cruz sheet; the compiler is therefore unable to determine definitely the exact course of the stream.

Trout Creek; Santa Clara River basin; Ventura County; rises in the western part of T. 6 N., R. 21 W., San Bernardino base and meridian, at altitude 5,000 feet above sea level; flows southwestward into Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, 3 miles; fall, 2,000 feet. Mount Pinos sheet.

Trout Creek; Truckee River basin; Nevada County; rises in the northwestern part of T. 17 N., R. 16 E., Mount Diablo base and meridian, at altitude 6,900 feet above sea level; flows east and southeast and enters Truckee River (tributary to Pyramid and Winnemucca Lakes) at the town of Truckee; length, about 4 miles; fall, 1,100 feet. Truckee sheet.

Truckee River; California-Nevada; rises in Lake Tahoe, at altitude 6,225 feet above sea level; flows almost due north to the town of Truckee, then takes a general northeasterly course to Wadsworth, Nev., turns again to the north and west of north and discharges into Pyramid and Winnemucca lakes, sending a stream to each lake (see Pyramid and Winnemucca lakes); total length, about 110 miles; fall, about 2,350 feet. From Lake Tahoe to Verdi, Nev., a distance of 35 miles, the country is heavily timbered with fir and pine; below Verdi barren wastes alternate with small and fertile valleys—the Verdi Valley, the Reno or Truckee Valley, and the Wadsworth Valley—all of which have rich, productive soil.

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The most important tributaries of the Truckee are Donner Creek, the outlet of Donner Lake, Prosser Creek, and Little Truckee River, which carries the overflow of Webber and Independence lakes.

The river is used for power development by the Farad (Mystic), Fleish, and Washoe plants, and an emergency plant near Reno, Nev. These plants have an average capacity of about 2,500 horse-power each and supply practically all the power used by the towns of Verdi, Reno, Carson City, Yerington, Gardnerville, Sparks, and Virginia City, Nev. Almost the entire minimum flow of the river is appropriated for irrigation and power.

Gaging station at Tahoe (1895–96, 1900–1912); near Nevada-California State line (1899–1912).

Authorities: Truckee, Reno, and Wadsworth sheets; Water-Supply Paper U. S. Geol. Survey No. 290, 1912, pp. 180–181.

Truckee River, Little; Sierra and Nevada counties; rises in Sierra County, in the south-central part of T. 19 N., R. 14 E., Mount Diablo base and meridian, in Webber Lake, at altitude 6,750 feet above sea level; takes a general easterly course to the southern part of T. 19 N., R. 17 E., where it turns abruptly and flows southward to its junction with Truckee River (tributary to Pyramid and Winnemucca lakes) at Boca; length, including major windings, about 25 miles; principal tributaries, Independence, Sage Hen, and Dry creeks; fall, about 1,200 feet. Gaging stations at Starr (1903–1910) and at Boca (1911–12). Sierraville and Truckee sheets.

Truckee River, Upper; Alpine and Eldorado counties; rises in Alpine County, in the southern part of T. 10 N., R. 18 E., Mount Diablo base and meridian, at altitude 8,750 feet above sea level; flows northward to Lake Tahoe, which discharges through Truckee River to Pyramid and Winnemucca Lakes, Nev.; length, about 18 miles; fall, about 2,500 feet. Pyramid Peak and Markleeville sheets.

Trumbull Lake; Mono County; northwestern part of T. 2 N., R. 25 E., Mount Diablo base and meridian; outlet, a stream three-fourths mile long, flowing eastward to Virginia Creek (tributary through East Walker River to Walker River, which discharges to Walker Lake); altitude, 9,650 feet; fall of outlet, about 150 feet. Bridgeport sheet.

Tucalota Creek; Riverside County; Santa Margarita River basin; rises on Red Mountain in the southeastern part of T. 6 S., R. 1 E., San Bernardino base and meridian, at altitude 3,500 feet above sea level; flows in general southwestward about 9 miles; drains parts of Tps. 6 and 7 S., Rs. 1 E. and 1 W. San Jacinto sheet.

Tujunga Creek; Los Angeles County; rises in the northeastern part of T. 2 N., R 11 W., San Bernardino base and meridian, at altitude about 5,000 feet above sea level; takes a very irregular but in general westerly course to the valley of San Fernando, where it has made several broad and deep washes, which turn to the south and join Los Angeles River (tributary to the Pacific) 6 or 8 miles west of the eastern end of the valley; during low water the stream seldom runs much beyond the opening of its canyon, and only in times of flood do the waters reach the main river above ground; length above the mouth of the canyon, including major windings, about 22 miles, in which distance it falls about 3,500 feet. Tujunga, Fernando, and Santa Monica sheet; Irrigation in California [southern], by Wm. Ham. Hall, Sacramento, 1888, p. 383.

Tujunga Creek, Little; Los Angeles River basin; Los Angeles County; rises in the Angeles National Forest, at altitude 4,250 feet above sea level; flows southwestward 6 miles to the eastern edge of San Fernando Valley; the canyon occupies a position about midway between its flanking ridges and receives tributaries from both sides, so that the whole area is a deep, serrated trough

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in the mountain. The basin comprises about 28 square miles, and delivers its waters out of a precipice-walled canyon, nearly 4 miles west and north of Big Tujunga Canyon. Its wash extends out into the main valley and joins that of Tujunga Creek on the east; its waters seldom flow beyond the opening of the canyon later than June, and only in times of exceptional floods do they run above ground all the way to the trough of the main valley. Fernando sheet; Irrigation in California [southern], by Wm. Ham. Hall, Sacramento, 1888, pp. 383–384.

Tuledad Canyon Creek; Lassen County; northeastern part; rises 3 miles southwest of Hat Peak at altitude 6,100 feet above sea level; flows south of east 10 miles and discharges into a sink in Duck Flat, Nev. Alturas and Long Valley sheets.

Tule Creek; Klamath River basin; Trinity County; rises in the northwestern part of T. 30 N., R. 12 W., Mount Diablo base and meridian; flows in general northeastward into Hayfork River (tributary through South Fork of Trinity River to Trinity and thus to Klamath River, which discharges to the Pacific); length, 7 miles. Punnett's map of Trinity County.

Tule Creek; San Diego and Riverside counties; rises in the northwestern part of T. 9 S., R. 4 E., San Bernardino base and meridian, at altitude 5,500 feet above sea level; flows west of north 4 miles, then northeastward 4 miles to Coyote Creek, which discharges to the Colorado Desert; fall, 2,800 feet. Ramona sheet.

Tule Creek; Santa Clara River basin; Ventura County; rises in the northeastern part of T. 5 N., R. 24 W., San Bernardino base and meridian, at altitude 4,800 feet above sea level; flows easterly to its junction with Sespe Creek (tributary to Santa Clara River, which discharges to the Pacific); length, about 4 miles; intermittent in upper course. Mount Pinos sheet.

Tule Lake. *See* Rhett Lake.

Tule Pond; Alameda County; about 1 mile south of Niles; a very small pond which lies in a completely inclosed depression. Pleasanton sheet.

Tulucay Creek; Napa County; rises in the central part of T. 5 N., R. 3 W., Mount Diablo base and meridian, at altitude 1,100 feet above sea level; flows westward 5 miles, then southward 2 miles into Napa River (tributary to San Pablo Bay) south of the city of Napa. Napa sheet.

Tuna Canyon Creek; Los Angeles County; an intermittent stream, about 2½ miles long, rising in the southeastern part of T. 1 S., R. 17 W., San Bernardino base and meridian, and flowing southeastward to the Pacific Ocean. Calabasas sheet.

Tunnel Canyon Creek; Santa Barbara County; an intermittent stream, 2½ miles long, rising in the northern part of T. 9 N., R. 30 W., San Bernardino base and meridian, and flowing southwestward into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Tunnel Creek; Alameda Creek basin; Alameda County; an intermittent stream, about 2 miles long, rising in the southeastern part of T. 4 S., R. 3 E., Mount Diablo base and meridian, on the north slope of Cedar Mountain Ridge, and flowing northwestward to Arroyo Mocho (tributary through Arroyo las Positas to Arroyo de la Laguna, and thus to Alameda Creek, which discharges to San Francisco Bay). Tesla sheet.

Turner Dry Lake; San Bernardino County Tps. 6 and 7 N., R. 7 W., San Bernardino base and meridian; contains water only during or immediately after heavy rains. Water-Supply Paper U. S. Geol. Survey No. 278, p. 14 and Pl. VI.

Tuttle Creek; Inyo County; Sequoia National Forest; rises on the east slope of the Sierra east of Mount Le Conte (altitude, 13,960 feet) and north of Mount

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Langley (altitude, 14,042 feet); flows north of east 10 miles to the edge of Owens Valley, where its waters sink; fall, about 8,200 feet; principal tributary, Diez Creek. Gaging station, near Lone Pine (1906–1911). Mount Whitney sheet.

Twelvemile Creek; Modoc County, Cal.; rises in the northeastern part of the county at altitude 6,000 feet above sea level; flows northwestward and westward across the California-Nevada line, and then passes northward into the south end of Warner Valley near Warner Lake post office. Alturas and Long Valley sheets; Water-Supply Paper U. S. Geol. Survey No. 220, 1908, pp. 32–33, 49.

Twin Creeks; Santa Ana River basin; San Bernardino County; two small streams which bring their waters to the head of the plain on the north side of San Bernardino basin, about 5 miles northwest of the opening of City Creek; the streams drain an area measured along the crest of the mountains about 4 miles long and reach the valley alongside of each other. West Twin Creek flows through Waterman Canyon; East Twin Creek receives as its tributary Strawberry Creek. In years of extraordinary rainfall they are subject to floods through which their waters may run over out on the plain, even through to Warm Creek (tributary to Santa Ana River, which discharges to the Pacific) without sinking, but except at such times their flood flow seldom reaches more than a mile or two into the valley. Gaging station on Waterman Canyon Creek (West Twin) near San Bernardino (1911–12). Redlands and San Bernardino sheets; Irrigation in California [southern], Sacramento, 1888, pp. 122–123.

Twin Lakes; Kern County; T. 10 N., R. 15 W., San Bernardino base and meridian, northeast of Liebre Twins; intermittent; no outlet shown on map. Tejon sheet.

Twin Lakes; Mono County; Tps. 3 and 4 N., R. 24 E., Mount Diablo base and meridian; inlets, Cattle Creek and Robinson Creek, the latter flowing through the lakes to East Walker River (tributary to Walker River, which discharges to Walker Lake); 2 lakes connected by a avery short channel; altitude of the upper lake, 7,096 feet, of the lower, 7,076 feet; fall of Robinson Creek in the 10 miles below lower Twin Lake, about 600 feet. Bridgeport sheet.

Twin Lakes; Shasta and Lassen counties; 2 small lakes one lying on the boundary between Shasta and Lassen counties and the other 1 mile southwest; an outlet northward to Snag Lake is shown on the map (Lassen Peak sheet); altitude of the upper lake, about 7,300 feet; of the lower lake, 7,000 feet; the lakes are connected by a northward-flowing stream about 1 mile long.

Twin Sloughs; Solano County; in the tidal marsh on the north side of Suisun Bay between Wells Slough and Suisun Creek. Carquinez sheet.

Two Bar Creek; Santa Cruz County; an intermittent stream, 3 miles long, rising in the northwestern part of T. 9 S., R. 2 W., Mount Diablo base and meridian, and flowing southwestward into San Lorenzo River. Santa Cruz sheet.

U-Ko-Num Creek; Siskiyou County; rises in the southern part of T. 13 N., R. 7 E., Humboldt base and meridian; flows somewhat east of north 9 miles, then northwestward and westward 8 miles to its junction with Klamath River (tributary to the Pacific); tributaries (unnamed on the map) include a stream 7 miles long draining the south slope of Marble Mountain. Punnett's map of Siskiyou County.

Union Creek; Trinity County; rises in the eastern part of T. 37 N., R. 9 W., Mount Diablo base and meridian; flows northwestward and northward to its junction with Coffee Creek (tributary to Trinity River and thus through Klamath River to the Pacific); length, about 5 miles. Punnett's map of Trinity County.

Union Creek; Santa Cruz County; a stream, about 2 miles long, rising in the southern part of T. 8 S., R. 3 W., Mount Diablo base and meridian, and

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flowing south of west to Sempervirens Creek (tributary through Blooms Creek to Waddell Creek, which discharges to the Pacific). Santa Cruz sheet.

Upper Lake. *See* Alkali Lakes.

Usal Creek; Mendocino County; formed in the central part of T. 23 N., R. 18 W., Mount Diablo base and meridian, by the union of North, Middle, and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the south-central part of T. 24 N., R. 18 W., and flows, in general, east of south about 5 miles to its junction with the Middle and South forks. Below the forks Usal Creek flows southwestward and enters the Pacific Ocean at Usal; length below the forks, 1 mile. Punnett's map of Mendocino County.

Usal Creek, Middle Fork; Mendocino County; rises in the extreme southwestern part of T. 24 N., R. 17 W., Mount Diablo base and meridian; flows south of west about 1½ miles, then almost directly south 3 miles to its junction with Usal Creek through which it is tributary to the Pacific. Punnett's map of Mendocino County.

Usal Creek, North Fork. *See* Usal Creek.

Usal Creek, South Fork; Mendocino County; rises in the western part of T. 23 N., R. 17 W., Mount Diablo base and meridian; flows southwestward about 2 miles, then northwestward 2 miles into Usal Creek through which it is tributary to the Pacific. Punnett's map of Mendocino County.

Uvas Creek; Santa Clara County; rises in the southeastern part of T. 9 S., R. 1 E., Mount Diablo base and meridian; takes a general southeasterly course to its junction with Pacheco Creek (tributary to Pajaro River, which discharges to the Pacific in Monterey Bay) northeast of Sargent; length, about 25 miles. Land Office map of California, 1907.

Valentine Creek; Mendocino County; rises in the northeastern part of T. 16 N., R. 14 W., Mount Diablo base and meridian, 1 mile west of Leonard Lake; flows northwestward into Big River (tributary to the Pacific); length, 3 miles. Punnett's map of Mendocino County.

Vallecitos Creek; Alameda Creek basin; Alameda County; an intermittent stream, rising in Valle de San Jose Rancho and flowing south of west to Sunol, where it enters Arroyo de la Laguna (tributary to Alameda Creek, which discharges to San Francisco Bay); length, about 4 miles; fall, 1,350 feet. Pleasanton sheet.

Van Duzen River; Trinity and Humboldt counties; rises in Trinity County, in the southern part of T. 2 S., R. 7 E., Humboldt base and meridian; takes a general northwesterly course to the central part of T. 2 N., R. 1 W., where it unites with Eel River (tributary to the Pacific); length, including major windings, about 60 miles; principal tributaries South Fork, Little Larribee Creek, Grizzly Gulch, and Yager Creek. Gaging station at Bridgeville (1911–12). Punnett's maps of Trinity and Humboldt counties.

Van Duzen River, South Fork; Humboldt County; rises in the northeastern part of T. 2 S., R. 5 E., Humboldt base and meridian; flows west of north 13 miles to its junction with Van Duzen River (tributary to Eel River, which discharges to the Pacific). Punnett's map of Humboldt County.

Van Matre Creek; Trinity County; rises in the eastern part of T. 35 N., R. 10 W., Mount Diablo base and meridian; flows northeastward 3 miles into Stewart Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Van Tassel Canyon Creek; Los Angeles County; rises in the northwestern part of T. 1 N., R. 10 W, San Bernardino base and meridian, at altitude 3,000 feet above sea level; flows southeastward 2 miles; sinks before reaching San

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Gabriel River (tributary to the Pacific); fall, 2,000 feet; intermittent. Pomona sheet.

Vasquez Creek; Los Angeles County; an intermittent stream, 1 mile long, flowing northwestward into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific) near Hoyt Ranch. Tujunga sheet.

Ventura River; Santa Barbara and Ventura counties; rises in the eastern part of Santa Barbara County in the southeastern part of T. 6 N., R. 24 W., San Bernardino base and meridian, at altitude 5,500 feet above sea level; flows southeastward to the upper end of Ojai Valley, then southward to the point at which it enters the Pacific Ocean near the city of Ventura; called Matilija Creek above Ojai Valley; length, including major windings, about 30 miles; principal tributaries, North Fork [of Matilija], San Antonio, and Coyote creeks. Gaging stations near Nordhoff and near Ventura (1911–12). Mount Pinos and Ventura sheets. *See also* Matilija Creek.

Verdugo Canyon Creek; Riverside and Orange counties; an intermittent stream, about 4½ miles long, flowing southwestward and entering San Juan Canyon Creek in Mission Viejo Rancho, opposite and just above the mouth of Bell Canyon Creek; fall, about 2,000 feet. Elsinore and Corona sheets.

Verdugo Creek; Los Angeles County; the main drainage way of the Canada Pass country; rises on the eastern slope of Verdugo Mountains, at altitude about 1,750 feet above sea level; flows southeasterly along the base of the mountains about 4 miles, then turns to the south and southwest and escapes through an open canyon between the Verdugo and San Rafael Hills into the San Fernando Valley at its extreme eastern end; the total area tributary to this creek comprises about 32 square miles; only its flood waters reach Los Angeles River (tributary to the Pacific). Santa Monica and Pasadena sheets; Irrigation in southern California, by Wm. Ham. Hall, Sacramento, 1888, p. 389.

Vibonas Creek; San Benito County; rises in the northwestern part of T. 12 S., R. 7 E., Mount Diablo base and meridian, south of Antimony Mountain; flows north of west about 10 miles to its junction with Pacheco Creek (tributary to Pajaro River, which discharges to the Pacific in Monterey Bay). Land Office map of California, 1907.

Victor Dry Lakes; San Bernardino County; Tps. 4 and 5 N., R. 3 W., San Bernardino base and meridian, near Victorville. *See* Mohave River. Water-Supply Paper U. S. Geol. Survey No. 224, Pl. I.

Villa Creek; San Luis Obispo County; rises on the western slope of the Santa Lucia Range south of Piney Ridge, at altitude 2,250 feet above sea level; flows west of south into the East Fork of Corral de Piedra (tributary to Pismo Creek, which discharges to the Pacific); length, 2½ miles; intermittent. San Luis Obispo and Arroyo Grande sheets.

Villa Creek; San Luis Obispo County; rises in the southern part of T. 27 S., R. 9 E., Mount Diablo base and meridian; flows in general southward, and enters the Pacific in San Geronimo Rancho, 2 miles northwest of Cayucos Point; tributary, Ellysly Creek. Cayucos sheet.

Vincent Gulch Creek; Los Angeles County; rises in the northwestern part of T. 3 N., R. 8 W., San Bernardino base and meridian, at altitude 6,500 feet above sea level; flows southeastward 3 miles into Prairie Fork (tributary to San Gabriel River, which discharges to the Pacific); fall, 2,000 feet. San Antonio sheet.

Vineyard Creek; Monterey and San Luis Obispo counties; rises in the northern part of T. 23 S., R. 13 E., Mount Diablo base and meridian; flows southwestward to its junction with Salinas River (tributary to the Pacific in Monterey Bay) just north of San Miguel; length, 14 miles. Land Office map of California, 1907.

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Violin Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, 4 miles long, rising in the southern part of T. 6 N., R. 17 W., and flowing southeasterly into Palomas Canyon Creek (tributary through Castac Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Virgin Creek; Trinity County; rises in the central part of T. 9 N., R. 7 E., Humboldt base and meridian; flows southwestward 3 miles, then southeastward 8 miles to the northeastern part of T. 7 N., R. 7 E., where it enters New River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Virginia Creek; Mono County; rises in Virginia Lakes, in the northeastern part of T. 2 N., R. 24 E., Mount Diablo base and meridian, at altitude 10,600 feet above sea level; flows northeastward 8 miles, then north and northwest 10 miles to the northwestern part of T. 4 N., R. 25 E., where it unites with Green Creek to form East Walker River (tributary through Walker River to Walker Lake); fall, 4,100 feet; principal tributaries, Dog and Clearwater creeks. Bridgeport sheet.

Virginia Lakes; Mono County; T. 2 N., Rs. 24 and 25 E., Mount Diablo base and meridian; outlet, Virginia Creek to East Walker River (tributary through Walker River to Walker Lake) a group of small lakes, 9 being shown on the map; the highest lies at altitude 10,600 feet above sea level, and the lowest, 2 miles farther east, about 9,700 feet above. Bridgeport sheet.

Vivian Creek; San Bernardino County; rises in the northeastern part of T. 1 S., R. 1 E., San Bernardino base and meridian, 1 mile west of San Gorgonio Mountain, at altitude 10,500 feet above sea level; flows southwestward into Mill Creek (tributary to Santa Ana River, which discharges to the Pacific); length, about 3 miles; fall, 4,200 feet. San Gorgonio sheet.

Volfe Canyon Creek; Los Angeles County; San Gabriel River basin; an intermittent stream, 1½ miles long, rising in the northeastern part of T. 1 N., R. 9 W., San Bernardino base and meridian, and flowing southward into Big Dalton Canyon (tributary to San Gabriel River, which discharges to the Pacific). Pomona sheet.

Waddell Creek; San Mateo and Santa Cruz counties; formed by the junction of East and West Waddell creeks. East Waddell Creek, which drains the larger area and is therefore considered the continuation of the main stream, rises near Hollow Tree Camp, in the western part of T. 8 S., R. 3 W., Mount Diablo base and meridian; flows sontheastward 4 miles, then southwestward to the junction with the West Fork; below the forks the creek flows west of south to the point at which it enters the Pacific, 3 miles southeast of Año Nuevo Point. Santa Cruz sheet.

Waddell Creek, East. *See* Waddell Creek.

Waddell Creek, West; San Mateo and Santa Cruz counties; rises in Santa Cruz county, in the southwestern part of T. 8 S., R. 3 W., Mount Diablo base and meridian, near Hollow Tree Camp; flows southwestward, crossing the southeastern corner of San Mateo County (T. 8 S., R. 4 W.), reenters Santa Cruz county, and flows in general west of south to its junction with East Waddell with which it forms Waddell Creek (tributary to the Pacific); about 6 miles long; tributaries, Berry and Henry creeks. Santa Cruz sheet.

Wages Creek; Mendocino County; rises in the southwestern part of T. 21 N., R. 16 W., Mount Diablo base and meridian; flows in general north of west to the point at which it enters the Pacific half a mile south of De Haven; length, about 7 miles. Punnett's map of Mendocino County.

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Walker Creek; Mono Lake basin; Mono County; Mono National Forest; rises on the east slope of the Sierra in a small lake half a mile east of Mono Pass, at altitude 10,400 feet above sea level; flows northeastward 8 miles to its junction with Rush Creek (tributary to Mono Lake); fall, about 4,000 feet, of which about 2,500 feet is made in a little more than 2 miles in Bloody Canyon above Walker Lake. Mount Lyell sheet.

Walker Creek; Owens River basin; Inyo County; Kern National Forest; rises on the east slope of the Sierra 1 mile northeast of Olancha Pass at altitude 8,500 feet above sea level; flows northeastward to the edge of Owens Valley south of Olancha, where its waters sink; length, 6 miles; fall, 4,600 feet, of which 3,500 feet is made in the first 3 miles; principal tributary, Falls Creek. Olancha sheet.

Walker Lake; Mono County. Mono National Forest; northeastern part of T. 1 S., R. 25 E., Mount Diablo base and meridian; outlet, Walker Creek, which flows through the lake to its junction with Rush Creek (tributary to Mono Lake); altitude, 7,926 feet; fall of Walker Creek in the 5 miles below the lake, about 1,200 feet. Mount Lyell sheet.

Walker Lake, Nevada. *See* Walker River.

Walker River; California-Nevada; formed in Mason Valley, Nev., by the union of East and West Walker rivers. The East Walker, which drains the large area and is therefore considered the continuation of the main stream, is formed in the northwestern part of T. 4 N., R. 25 E., Mount Diablo base and meridian, by the junction of Green and Virginia creeks; of these two, Virginia Creek drains the larger area and must therefore be considered the head of Walker River. Virginia Creek rises in Virginia Lakes, in T. 2 N., Rs. 24 and 25 E., at altitude about 10,600 feet above sea level; flows northeastward 8 miles, then to the north and west of north 10 miles to the point at which it receives Green Creek; from this point the East Walker flows northeastward into Esmeralda County, Nev., then winds to the north and northwest to Mason Valley, where it receives West Walker; below the forks the river flows sluggishly northward, passing through Mason (Yerington) Valley to a point east of Wabuska, where it turns to the east and southeast, and 50 miles beyond the forks enters Walker Lake. Length from Walker Lake to head of Virginia Creek, 136 miles,[1] in which distance the total fall is 6,500 feet; fall in the 50 miles below the junction of the East and West Walker, about 400 feet.

Walker Lake into which the river flows, is next to Pyramid Lake the most picturesque and attractive of the desert lakes of Nevada. As one of the lakes occupied by glacial Lake Lahontan, it was thus described by Russell[2]:

"The lake is 25.6 miles in its longer, or north and south axis, and has an average width of between 4.5 and 5 miles. Its area is 95 square miles. Over a large area in the central and western portions it has a remarkably uniform depth of 224 feet; but as a rule the depth increases as one approaches the western shore, which is overshadowed by rugged mountains. The bottom throughout the central portions is composed of fine tenacious mud, which in many places is black in color and has the odor of hydrogen sulphide. Coarser deposits, consisting of sand and gravel, mingled with the empty shells of Pyrgula and Pompholyx, etc., were found only in the immediate neighborhood of the shore. * * *

"As in the case of the other lakes in the Great Basin situated at an elevation of less than 5,000 feet, the shores of Walker Lake are totally lacking in arboreal

[1] Measured with wheel on Bridgeport, Wellington, Wabuska, Carson Sink, and Hawthorne sheets.

[2] Russell, I. C., Geological history of Lake Lahontan, a Quaternary lake of northwestern Nevada: Mon. U. S. Geol. Survey, vol. 11, 1885, pp. 69–70.

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vegetation except at the river mouth and are clothed only with desert shrubs. At the northern end, and following the immediate shores of Walker River for many miles, are luxuriant cottonwood groves, together with willow banks and meadow lands.

"The waters at a distance from the river mouth are of a clear, deep blue, changing to a bright-green tint near the shore, as in Pyramid Lake. They are charged with saline matter to such an extent that carbonate of lime is now being deposited."

The basin of Walker River contains three important valleys—Antelope and Smith valleys on the West Fork and Yerington Valley (Mason Valley), which takes its water from both forks. The minimum flow of the river is not sufficient to supply the demand during the summer months, but excellent reservoir sites near the head-waters of the forks are available for storing the flood waters for use during the dry season. The snowfall on the mountains in the winter months is very heavy, giving assurance of an ample water supply for the reservoirs.

Gaging station on East Walker River near Bridgeport (1911–12).

Authorities: Bridgeport, Dardanelles, Wabuska, Wellington, Hawthorne, and Carson Sink sheets; Water-Supply Paper U. S. Geol. Survey No. 290, 1912, pp. 150–151. *See also* footnotes on page 230.

Walker River, East. *See* Walker River.

Walker River, West; Mono County; formed in the center of T. 5 N., R. 22 E., Mount Diablo base and meridian, by the union of its Middle and West forks; the Middle Fork, which drains the larger area and is therefore considered the continuation of the West Walker, rises in the northeastern part of T. 4 N., R. 22 E., at altitude 11,200 feet above sea level; takes a general northerly course to the point at which it receives West Fork; below the forks the general course of the river is northeastward to Mason Valley where it joins the East Walker. The basins of the two forks are separated by a group of mountains known as the Sweetwater Range; length from head of Middle Fork to junction with East Walker, 75 miles; total fall of the West Walker from the head of its Middle Fork to its junction with East Walker, 6,700 feet; fall in the 20 miles between Wellington and the junction with the East Walker, about 300 feet. Gaging station near Coleville (1902–1908). Dardanelles, Bridgeport, Markleeville, and Wellington sheets.

Walker River, West, West Fork of; Mono County; rises in the eastern part of T. 4 N., R. 21 E., Mount Diablo base and meridian, on the north slope of Grizzly Peak, at altitude 9,700 feet above sea level; flows northeastward about 8 miles to the central part of T. 5 N., R. 22 E. where it unites with the Middle Fork to form West Walker River (tributary through Walker River to Walker Lake); fall, 2,200 feet. Dardanelles sheet.

Walkers Creek; Siskiyou County; rises in the southeastern part of T. 45 N., R. 12 W., Mount Diablo base and meridian; flows in general northward 9 miles to its junction with Klamath River (tributary to the Pacific). Punnett's map of Siskiyou County.

Walker Valley Creek; Mendocino County. *See* Forsythe Creek.

Wallace Creek; San Bernardino and Riverside counties; Santa Ana River basin; rises in the northeastern part of T. 2 S., R. 1 W., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southwestward 1½ miles into Little San Gorgonio Creek (tributary through San Timoteo Creek to Santa Ana River); fall, 1,100 feet. San Gorgonio sheet.

Walnut Creek; Contra Costa County; formed near the town of Walnut Creek by the union of two branches, one from the west, called the Lafayette

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Branch, and one from the south, called San Ramon Creek; the southern branch—San Ramon Creek—which drains the larger area and is therefore considered the continuation of the main stream, rises in the southeastern part of T. 1 S., R. 2 W., Mount Diablo base and meridian, on the western slope of Las Trampas Ridge, flows southeastward 5 miles, encircles the southeastern base of the ridge, and turns to the northwest, in which direction it continues to flow to its junction with the Lafayette Branch. Below this junction Walnut Creek flows northward to the tidal marsh on the south side of Suisun Bay which it enters as Pacheco Creek; the southeastward-flowing stretch at the head is called Bolinger Creek; length from the bay to the head of Bolinger Creek, about 30 miles; principal tributaries, Sycamore and Green Valley creeks, Lafayette Branch and Grayson Creek. Mount Diablo, Concord, and Carquinez sheets.

Walnut Creek; San Gabriel River basin; Los Angeles County; a drainage way marked on the Pomona sheet as a sandy wash lying along the north base of the San Jose Hills parallel to and about 3 miles south of the San Dimas Wash.

Ward Creek; Placer County; rises in the western part of T. 15 N.. R. 16 E., Mount Diablo base and meridian, on the south slope of Ward Peak, at altitude 8,000 feet above sea level; flows south of east 5 miles to McKinney Bay where it enters Lake Tahoe (outlet through Truckee River to Pyramid and Winnemucca lakes); fall, 1,775 feet. Truckee sheet.

Wards Creek; Sonoma County; rises in the northeastern part of T. 8 N.. R. 12 W., Mount Diablo base and meridian; flows southward 2½ miles, then eastward 4 miles to its junction with Austin Creek (tributary to Russian River, which flows into the Pacific) at Cazadero. Punnett's map of Sonoma County.

Warm Creek; Santa Ana River basin; rises in the northeastern part of San Bernardino Valley, about 2 miles north of Santa Ana River, 2 miles west of the opening of City Creek Canyon and 2 miles south of the edge of the mountain; flows southwestward about 8 miles to Santa Ana River (tributary to the Pacific) near the lower part of the San Bernardino basin; receives accessions from springs in its bed and in arroyos or cienegas which join it; the creek is the reappearance of some of the lost waters of the canyon creeks from City Creek to Cajon Pass. Lytle Creek joins it just below the city of San Bernardino, and they thence occupy one channel to the river half a mile east of Colton. See also City Creek. Redlands and San Bernardino sheets; Irrigation in California [southern], by Wm. Ham. Hall, Sacramento, 1888, pp. 125–126.

Warm Spring Canyon Creek; Santa Ana River basin; San Bernardino County; rises in the southeastern part of T. 1 N., R. 2 W., San Bernardino base and meridian, at altitude 4,000 feet above sea level; flows westward and southwestward into Santa Ana River (tributary to the Pacific); length, 2½ miles; fall, 1,900 feet; intermittent. Redlands sheet.

Warm Spring Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream, 2 miles long, rising in the western part of T. 6 N., R. 16 W., San Bernardino base and meridian, and flowing south of east into Elizabeth Lake Canyon Creek (tributary through Castac Creek to Santa Clara River, which discharges to the Pacific). Tejon sheet.

Warm Springs Creek; Russian River basin: Sonoma County; rises in the northern part of T. 9 N., R. 11 W., Mount Diablo base and meridian; flows northwestward 3 miles, then winds irregularly northeastward to its junction with Dry Creek (tributary through Russian River to the Pacific); length, including major windings, 12 miles; course circuitous; principal tributary, Ranchero Creek. Punnett's map of Sonoma County.

Warm Springs Creek; Santa Margarita River basin; Riverside County; rises in the eastern part of T. 6 S., R. 3 W., San Bernardino base and meridian, at

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the south end of Paloma Valley; flows southwestward about 9 miles into Murietta Creek (tributary to Santa Margarita River, which discharges to the Pacific); intermittent. Elsinore sheet.

Warren Fork; Mono County, Mono National Forest; rises in the northern part of T. 1 N., R. 25 E., Mount Diablo base and meridian, at altitude 10,350 feet above sea level; flows southeastward into Leevining Creek (tributary to Mono Lake); length, 3 miles; fall, 2,400 feet. Mount Lyell sheet.

Water Canyon Creek; Los Angeles County; rises in northeastern part of T. 1 N., R. 10 W., San Bernardino base and meridian, at altitude 2,250 feet above sea level; flows southeastward toward San Gabriel River (tributary to the Pacific); length, about 1 mile; fall, 1,150 feet; intermittent. Pomona sheet.

Waterman Canyon Creek. *See* Twin Creeks.

Watson Lakes; Los Angeles County; sloughlike water bodies north of Wilmington Lagoon, discharging to the lagoon through Compton Creek. Downey sheet.

Weaver Creek; Trinity County; formed in the western part of T. 33 N., R. 9 W., Mount Diablo base and meridian, by the union of East and West Weaver Creeks. West Weaver Creek, which drains the larger area and is therefore considered the continuation of the main stream, rises in the northern part of T. 34 N., R. 10 W.; flows southeastward to a point just below Weaverville where it receives East Fork; below the forks the general course of the stream is somewhat west of south to Douglas City, where it enters Trinity River (tributary to Klamath River, which discharges to the Pacific); length to head of West Weaver, about 13 miles; principal tributary above forks, Garden Gulch Creek; below forks, Browns Creek. Punnett's map of Trinity County.

Weaver Creek, East; rises in the northern part of T. 34 N., R. 10 W., Mount Diablo base and meridian; flows southeastward 4½ miles, then southward and southwestward 3 miles to its junction with West Weaver (tributary to Trinity River) near Weaverville. Punnett's map of Trinity County.

Weaver Creek, West. *See* Weaver Creek.

Webber Lake; Sierra County; south-central part of T. 19 N., R. 14 E., Mount Diablo base and meridian; inlets, two streams which drain the eastern slopes of Webber Peak; outlet, Little Truckee River to Truckee River (tributary to Pyramid and Winnemucca lakes); altitude, 6,750 feet. Truckee sheet.

Welch Creek; Alameda Creek basin; Alameda County; rises in the southwestern part of T. 4 S., R. 2 E., Mount Diablo base and meridian, on the west slope of Valpe Ridge, at altitude 2,100 feet above sea level; flows irregularly westward 3 miles into Alameda Creek (tributary to San Francisco Bay) at the southern end of Sunol Valley; fall, 1,750 feet. Pleasanton sheet.

Weldon Canyon Creek; Ventura County; an intermittent stream, 2½ miles long, rising in the southwestern part of Ex Mission San Buenaventura Rancho, and flowing southwestward into Ventura River (tributary to the Pacific) near Rock Station. Ventura sheet.

Wellman Canyon Creek; Santa Barbara County; an intermittent stream, 5 miles long, rising in the southwestern part of T. 10 N., R. 28 W., San Bernardino base and meridian, and flowing southwestward to Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Santa Ynez sheet.

Wells Slough; Solano County; in the tidal marsh on the north side of Suisun Bay. Napa sheet.

West Lake; Los Angeles County, near the west border of the city of Los Angeles, Santa Monica sheet.

West Lake; Nevada County; northwestern part of T. 17 N., R. 15 E., Mount Diablo base and meridian; one of a group of small lakes about 2 miles northwest

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of the head of Donner Lake; mapped as without outlet, but contours indicate possible discharge southward to Angela Lake; altitude of West Lake, about 7,350 feet. Truckee sheet.

West Lake; Walker River basin; Mono County; south-central part of T. 3 N., R. 24 E., Mount Diablo base and meridian; inlet from Bergona Lake; outlet to Green Lake on West Fork Green Creek (tributary through Green Creek to Virginia Creek and thus through East Walker River to Walker River, which discharges to Walker Lake); altitude, about 9,900 feet; fall of outlet in the half mile to Green Lake, 950 feet. Bridgeport sheet.

West Point Creek; San Mateo County; a channel in the tidal marsh in the southern end of San Francisco Bay, extending from Redwood Creek southeastward to Ravenswood Slough. Haywards and Palo Alto sheets.

West Ravine; Los Angeles County; an intermittent stream, about a mile long; flows southwestward toward Arroyo Seco (tributary to Los Angeles River, which discharges to the Pacific), which however it does not reach except in times of flood. Pasadena sheet.

West Union Creek; San Francisquito Creek basin; San Mateo County; a stream, about 2½ miles long, rising in Canada de Raymundo Rancho and flowing southeastward to Bear Creek (tributary to San Francisquito Creek, which flows to San Francisco Bay) near Woodside. Santa Cruz sheet.

West Walker River. *See* Walker River, West.

West Weaver Creek. *See* Weaver Creek.

Wheatfield Fork. *See* Gualala River.

Wheaton Wash; San Bernardino County; T. 16 N., R. 14 E., San Bernardino base and meridian; a drainage way extending eastward from the Ivanpah Mountains toward Ivanpah Valley. Ivanpah sheet.

Wheeler Canyon Creek; Ventura County; rises on the southern slope of Sulphur Mountain, in Ex Mission San Buenaventura Rancho, at altitude 1,500 feet above sea level; flows southward to Santa Clara River (tributary to the Pacific); length, 6 miles; fall, 1,250 feet; tributary, Hampton Canyon Creek. Santa Paula sheet.

White Gulch Creek; Siskiyou County; rises in the northern part of T. 39 N., R. 10 W., Mount Diablo base and meridian; flows northwestward 3 miles, then westward 2 miles into North Fork of Salmon River (tributary through Salmon River to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

White Rock Creek; Mendocino County; rises in the northeastern part of T. 22 N., R. 15 W., Mount Diablo base and meridian, on the south slope of Iron Peak; flows east of south 2 miles, then north of east 3 miles into Woodman Creek (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Whitehouse Creek; Santa Cruz and San Mateo counties; rises on the west slope of The Chalks, in T. 9 S., R. 4 W., Mount Diablo base and meridian; flows southwestward into the Pacific Ocean 1 mile southeast of Franklin Point. Santa Cruz sheet.

Whites Creek; Trinity County; rises in the northwestern part of T. 35 N., R. 12 W., Mount Diablo base and meridian; flows northeastward 6 miles to its junction with North Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Whitewater River; San Bernardino and Riverside counties; rises in the northwestern part of T. 1 S., R. 2 E., San Bernardino base and meridian, on San Gorgonio Mountain (altitude, 11,485 feet); flows southeastward, and discharges into the Colorado Desert at the northern end of the Salton Sink. At

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the foot of San Gorgonio Pass its waters are divided, one portion being used for irrigation in the vicinity of Whitewater, while another portion, at one time used for irrigation at Palm Springs, is allowed to waste into the desert. San Gorgonio, San Jacinto and Indio special sheets. Ground waters of the Indio region, California: Water-Supply Paper U. S. Geol. Survey No. 225, 1909, p. 30.

Whitlock Creek; Alameda Creek basin; Alameda County; rises in the eastern part of T. 5 S., R. 2 E., Mount Diablo base and meridian, at altitude 3,350 feet above sea level; flows southwestward into Alameda Creek, which discharges into San Francisco Bay; length, about 3 miles; fall, 2,200 feet. Tesla and Mount Hamilton sheets.

Whitney Creek; Siskiyou County; flows from Whitney Glacier on the north slope of Mount Shasta (altitude, 14,380 feet), northwestward into the lava beds at the base of the mountain; the natural drainage of this side of Mount Shasta is toward Shasta River. Shasta and Shasta special sheets.

Wickiup Canyon Creek; Los Angeles County; rises in the southeastern part of T. 3 N., R. 12 W., San Bernardino base and meridian, at altitude 4,350 feet above sea level; flows west of north about 3 miles into Tujunga Creek (tributary to Los Angeles River, which discharges to the Pacific); fall, 1,100 feet. Tujunga sheet.

Widow Reed Creek; Marin County; rises in the northern part of Corte de Madera Rancho, at altitude about 300 feet above sea level; flows in general southeastward into the western arm of Richardson Bay through which it passes to San Francisco Bay; flows through tidal marsh in lower portion; length, about 3 miles; principal tributary, a stream flowing through Mill Valley. Tamalpais sheet.

Wildcat Creek; Klamath River basin; Siskiyou County; rises in the southwestern part of T. 40 N., R. 9 W., Mount Diablo base and meridian; flows north of east 6 miles to its junction with Scott River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Siskiyou County.

Wildcat Creek; San Pablo Creek basin; Contra Costa County; rises in the southern part of Sobrante Rancho, on the west slope of San Pablo Ridge, between Grizzly and Bald peaks, at altitude 1,500 feet above sea level; flows northwestward along the base of the ridge to its junction with San Pablo Creek, just before the latter joins the tidal marsh through which it enters San Pablo Bay; length, about 10 miles. Concord and San Francisco sheets.

Wild Cherry Canyon Creek; San Luis Obispo County; rises in the southern part of T. 31 S., R. 11 E., Mount Diablo base and meridian, in the San Luis Range, at altitude 1,000 feet above sea level; flows southeastward to the Pacific through San Luis Obispo Bay one-half mile west of the mouth of San Luis Obispo Creek; length, about 2½ miles. Port Harford and Arroyo Grande sheets.

Wildhorse Canyon Creek; Riverside County; rises in the southeastern part of T. 6 S., R. 5 W., San Bernardino base and meridian, at altitude 3,100 feet above sea level; flows west of south about 4 miles into Los Alamos Canyon Creek (tributary to San Mateo Creek); fall, 1,650 feet; intermittent. Elsinore sheet.

Wildhorse Canyon Creek; Santa Maria River basin; Santa Barbara County; an intermittent stream, 3 miles long, rising on the north slope of the San Rafael Mountains, in the southeastern part of Sisquoc Rancho, and flowing west of north into Sisquoc River (tributary to Santa Maria River, which discharges to the Pacific). Lompoc sheet.

Wild Rose Canyon; San Bernardino County; T. 3 N., R. 1 E., San Bernardino base and meridian; a drainage way discharging westward through Furnace Canyon to Mohave Desert. San Gorgonio sheet.

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Wiley Canyon Creek; Santa Clara River basin; Los Angeles County; an intermittent stream rising in the central part of T. 3 N., R. 16 W., San Bernardino base and meridian, and flowing northward to the valley west of Newhall, between Placerita and Pico Canyon creeks, where its waters sink; intermittent. Santa Susana sheet.

Wiley Canyon Creek; Santa Clara River basin; Ventura County; an intermittent stream, 1½ miles long, flowing northward to Santa Clara River (tributary to the Pacific) southwest of Buckhorn. Camulos sheet.

Willard Canyon; Santa Clara River basin; Ventura County; a drainage way opening northward to Santa Clara River (tributary to the Pacific) in T. 3 N., R. 20 W., San Bernardino base and meridian. Santa Paula sheet.

Willard Dry Lake; San Bernardino County; Tps. 30 and 31 S., R. 42 E., Mount Diablo base and meridian. Water-Supply Paper U. S. Geol. Survey No. 224, 1909, Pl. I and p. 52.

Willards Creek; Lassen County; rises in the northeastern part of T. 28 N., R. 10 E., Mount Diablo base and meridian, at altitude 6,400 feet above sea level; flows east of north 6 miles to its junction with Susan River (tributary to Honey Lake); fall, 1,700 feet. Honey Lake sheet.

Williams Creek; Eel River basin; Mendocino County; rises in the northwestern part of T. 23 N., R. 12 W., Mount Diablo base and meridian, in the Round Valley Indian Reservation; flows southeastward 5 miles, then in general southwestward 6 miles to its junction with Round Valley Creek (tributary through Middle Fork of Eel River to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Williams Creek; Honey Lake basin; Lassen County; rises in the northwestern part of T. 28 N., R. 11 E., Mount Diablo base and meridian, at altitude 5,600 feet above sea level; flows northward 4 miles into Susan River (tributary to Honey Lake); fall, 1,000 feet. Honey Lake sheet.

Williams Gulch Creek; Alameda County. *See* San Antonio Creek.

Williamson Canyon Creek; San Benito County; a stream, about 10 miles long, rising in the central part of T. 16 S., R. 6 E., Mount Diablo base and meridian, and flowing eastward and southeastward toward one of the upper tributaries of Chalona Creek (tributary to Salinas River, which discharges to the Pacific) immediately south of a small area drained by Johnson Creek to San Benito River. Land Office map of California, 1907.

Williamson Creek; Inyo County; rises on the east slope of the Sierra in a group of small lakes lying between Mount Tyndall (altitude, 14,025 feet) and Mount Williamson (altitude, 14,384 feet), at altitude 12,500 feet above sea level; flows northward and northeastward to its junction with Shepard Creek which discharges to Owens Valley; length, about 5 miles; fall, 5,000 feet. Mount Whitney sheet.

Williamson River; Klamath County, Oreg.; rises in the northeastern part of the county at altitude 5,000 feet above sea level; flows westward 4 miles, northward about 18 miles, then takes a southwesterly course to the point at which it enters Upper Klamath Lake (tributary to Klamath River, which discharges to the Pacific); passes through Klamath Marsh; length, about 60 miles; principal tributary, Sprague River. Klamath sheet.

Willits Creek; Mendocino County; rises in the southwestern part of T. 19 N., R. 14 W., Mount Diablo base and meridian; flows southeastward 6 miles, then north of east 2 miles into Deep Creek (tributary to Eel River, which discharges to the Pacific). Punnett's map of Mendocino County.

Willow Canyon Creek; Riverside County; Santa Margarita River basin; a short, intermittent, southwestward flowing stream, draining a portion of the

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southwestern part of T. 6 S., R. 1 E., San Bernardino base and meridian. San Jacinto sheet.

Willow Creek; Contra Costa County; a sloughlike creek in Los Medanos Rancho, flowing northward to the eastern end of Suisun Bay. Antioch sheet.

Willow Creek; Honey Lake basin; Lassen County; rises in the southeastern part of T. 32 N., R. 11 E., Mount Diablo base and meridian, 1 mile east of Eagle Lake, at altitude about 5,400 feet above sea level; takes a general southeasterly course to its junction with Petes Creek, through which it is tributary to Susan River; length above junction with Petes Creek, about 18 miles; fall, about 1,100 feet. Gaging station at Merrillville (1904–1905) and near Standish (1900–1905). Honey Lake sheet.

Willow Creek; Klamath River basin; Humboldt County; rises in the northern part of T. 5 N., R. 4 E., Humboldt base and meridian; flows northward 5 miles, northeastward 4 miles, eastward 1 mile to its junction with Trinity River (tributary to Klamath River, which discharges to the Pacific). Punnett's map of Humboldt County.

Willow Creek; Klamath River basin; Siskiyou County; rises in the southern part of T. 42 N., R. 7 W., Mount Diablo base and meridian; flows northeastward 12 miles; sinks before reaching Parks Creek (tributary through Shasta River to Klamath River, which discharges to the Pacific) to which its basin is topographically tributary. Shasta sheet; Punnett's Map of Siskiyou County.

Willow Creek; Klamath River basin; Siskiyou County; rises in the eastern part of T. 46 N., R. 4 W., Mount Diablo base and meridian, on the western slope of Willow Creek Mountain, at altitude 4,400 feet above sea level; flows south of west 4 miles, then northwestward 10 miles into Klamath River (tributary to the Pacific), which it enters in the southeastern part of T. 47 N., R. 6 W.; fall, 2,300 feet, of which 1,400 feet is made in the first 4 miles. Shasta sheet.

Willow Creek; Owens Lake basin; Inyo County; rises in the eastern part of T. 8 S., R. 32 E., Mount Diablo base and meridian, at altitude 9,000 feet above sea level; flows southeastward 2 miles, then north of east 2½ miles to the edge of Owens Valley, where its waters sink; fall, 4,900 feet. Bishop sheet.

Willow Creek; Pajaro River basin; San Benito County; rises in the southern part of T. 15 S., R. 6 E., Mount Diablo base and meridian; flows in general easterly into Johnson Creek through which it is tributary to San Benito River (Pajaro River, which discharges to the Pacific in Monterey Bay); length, about 6 miles. Land Office map of California, 1907.

Willow Creek; Rhett Lake basin; formed in Modoc County by the union of its North and South forks. The South Fork, which apparently drains the larger area and is therefore considered the continuation of the main stream, rises in the northern part of Modoc County about 10 miles west of Goose Lake; flows southwestward to Boles Meadow, then northwestward to its junction with the North Fork; below the forks the creek flows westward; a portion of the flood discharge of Willow Creek passes into Clear Lake but, at the same time, a large part passes down Lost River to Rhett Lake. See Clear Lake. Alturas and Modoc Lava Bed sheets.

Willow Creek; Russian River basin; Sonoma County; rises in the northern part of Bodega Rancho; flows northwestward and enters Russian River (tributary to the Pacific) near its mouth; length, 4½ miles. Punnett's map of Sonoma County.

Willow Creek; San Luis Obispo County; rises in the southeastern part of T. 28 S., R. 10 E., Mount Diablo base and meridian, at altitude 650 feet above sea level; flows southwestward 3½ miles into the Pacific in Estero Bay. Cayucos sheet.

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Willow Creek; Siskiyou County. *See* Cottonwood Creek.

Willow Creek; Ventura River basin; Ventura County; an intermittent stream, 2½ miles long, rising in the southeastern part of T. 4 N., R. 24 W., San Bernardino base and meridian, and flowing southeastward into Coyote Creek (tributary to Ventura River, which discharges to the Pacific). Ventura sheet.

Willow Creek, North Fork; Rhett Lake basin; rises in the northern part of Modoc County; takes a general southwesterly course to its junction with the South Fork, with which it forms Willow Creek (tributary through Lost River to Rhett Lake); intermittent. Alturas sheet.

Wills Canyon Creek; Ventura County; an intermittent stream, 2½ miles long, rising in the southwestern part of T. 5 N., R. 23 W., San Bernardino base and meridian, and flowing southeastward to Ventura River (tributary to the Pacific) in Ojai Valley. Ventura sheet.

Wilson Creek; Del Norte County; rises in the eastern part of T. 15 N., R. 1 E., Humboldt base and meridian; flows in general southwestward to the point at which it enters the Pacific, 4 miles northwest of Requa; length, about 8 miles. Punnett's map of Del Norte County.

Wilson Creek; Mono Lake basin; Mono County; rises in the northern part of T. 2 N., R. 25 E., Mount Diablo base and meridian, at altitude 9,600 feet above sea level; flows irregularly eastward into Mono Lake 1 mile above Black Point; length, 9 miles; fall, about 3,175 feet. Bridgeport sheet.

Wilson Creek; Santa Ana River basin; San Bernardino County; an intermittent stream, 2 miles long, rising in the northern part of T. 1 S., R. 1 W., San Bernardino base and meridian, and flowing southwestward into Yucaipe Creek (tributary through San Timoteo Creek to Santa Ana River, which discharges to the Pacific). San Gorgonio sheet.

Wilson Creek; Santa Margarita River basin; Riverside County; rises on Red Mountain in T. 6 S., R. 1 E., San Bernardino base and meridian, at altitude 4,500 feet above sea level; flows southward and southwestward, discharging into Wilson Valley in the northern part of T. 8 S., R. 1 E.; length, about 10 miles; the drainage line is broken in Reed Valley, but is indicated as a permanent water line from the south end of that valley. San Jacinto and Ramona sheets.

Winchester Canyon Creek; Bell Canyon Creek drainage basin; Santa Barbara County; rises in the Santa Barbara National Forest, on the south slope of the Santa Ynez Mountains, at altitude 700 feet above sea level; flows almost due south 3 miles to the head of Bell Canyon, through which it enters the Pacific. Goleta special sheet.

Windchuck River; Del Norte County, Cal. [Curry County, Oreg.?]; rises in the northwestern part of T. 18 N., R. 1 E., Humboldt base and meridian; flows northwestward and enters the Pacific in the extreme southwestern part of Curry County, Oreg.; length, about 6 miles. Punnett's map of Del Norte County. On the Land Office map of Oregon Windchuck River is drawn in the southwest corner of Curry County, no part of it extending into California.

Winnemucca Lake. *See* Pyramid and Winnemucca lakes.

Wise Creek; Mendocino County; rises in the northern part of T. 12 N., R. 12 W., Mount Diablo base and meridian; flows southeastward to its junction with Russian River (tributary to the Pacific) in the east-central part of T. 12 N., R. 11 W.; length, 8 miles. Punnett's map of Mendocino County.

Witch Creek; San Diego County; rises in the southwestern part of Santa Ysabel Rancho, at altitude of 3,000 feet above sea level; flows southwestward 2 miles, then northwestward 2 miles into Santa Ysabel Creek (San Dieguito River, which discharges to the Pacific); intermittent; fall, about 900 feet. Ramona sheet.

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Wolf Creek; Carson River basin; Alpine County; rises in the northeastern part of T. 7 N., R. 20 E., Mount Diablo base and meridian, on the north slope of Arnot Peak, at altitude 9,500 feet above sea level; takes a general northeasterly course to its junction with East Fork of Carson River (tributary through Carson River to Carson Sink); length, 11 miles; fall, 3,400 feet, of which 2,000 feet is made in the first 2½ miles. Dardanelles and Markleeville sheets.

Wolf Creek; Gualala River basin; Sonoma County; rises in the southeastern part of T. 10 N., R. 12 W., Mount Diablo base and meridian; flows somewhat south of west to its junction with Middle Fork of Gualala River (tributary through Wheatfield Fork to Gualala River and thus to the Pacific); length, 4½ miles. Punnett's map of Sonoma County.

Wolf Creek, Little; Humboldt County; rises in the western part of T. 8 N., R. 1 E., Humboldt base and meridian; flows southwestward into the Pacific 2 miles southeast of Trinidad Point. Punnett's map of Humboldt County.

Wolfskill Canyon Creek; Los Angeles County; San Gabriel River basin; rises in the north-central part of T. 1 N., R. 8 W., San Bernardino base and meridian, at altitude 5,250 feet above sea level; flows southwestward 2 miles, then north of west 2 miles into San Dimas Canyon; fall, 3,600 feet. Cucamonga and Pomona sheets.

Wolley Creek; Siskiyou County; rises in the central part of T. 43 N., R. 12 W., Mount Diablo base and meridian, on the east slope of Marble Mountain; takes a very irregular but in general southwesterly course to its junction with Salmon River (tributary to Klamath River, which discharges to the Pacific); length, including major windings, about 25 miles; receives a number of branching tributaries none of which are named on the map. Punnett's map of Siskiyou County.

Wood River, Klamath County, Oreg. *See* Anna River.

Woodman Creek; Mendocino County; rises in the southeastern part of T. 23 N., R. 15 W., Mount Diablo base and meridian, on the south slope of Iron Peak; flows southeastward 5 miles, then north of east 2½ miles to its junction with Eel River (tributary to the Pacific). Punnett's map of Mendocino County.

Wright Canyon Creek; San Diego County; rises in west-central part of T. 14 S., R. 2 E., San Bernardino base and meridian, at altitude 1,900 feet above sea level; flows southwestward into Padre Barona Creek (tributary through San Vicente Creek to San Diego River, which discharges to the Pacific through False Bay); intermittent; length, 3 miles; fall, about 600 feet. Cuyamaca sheet.

Yager Creek; Humboldt County; formed in the central part of T. 2 N., R. 2 E., Humboldt base and meridian, by the union of its North and South forks. The North Fork, which drains the larger area and is therefore considered the continuation of the main stream, rises in the western part of T. 2 N., R. 4 E., takes a general northwesterly course to the eastern part of T. 3 N., R. 2 E., whence its course is southwestward to the point at which it receives the South Fork; below the forks Yager Creek winds irregularly westward and southwestward to its junction with Van Duzen River (tributary to Eel River, which discharges to the Pacific) in the central part of T. 2 N., R. 1 E.; length from Van Duzen River to the head of the North Fork, including major windings, 25 miles; principal tributary below the forks, Lawrence Creek. Gaging station at Carlotta (1911–12). Punnett's map of Humboldt County.

Yager Creek, Middle Fork; Humboldt County; rises in the northwestern part of T. 2 N., R. 3 E., Humboldt base and meridian; flows south of west 3 miles to its junction with North Fork of Yager Creek (tributary through Yager Creek to Van Duzen River and thus to the Eel, which discharges to the Pacific). Punnett's map of Humboldt County.

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Yager Creek, North Fork. *See* Yager Creek.

Yager Creek, South Fork; Humboldt County; rises in the central part of T. 2 N., R. 3 E., Humboldt base and meridian, near Yagerville; flows north of west 3 miles, southwestward 2½ miles, then turns abruptly and flows west of north to its junction with Yager Creek (tributary to Van Duzen River and thus to Eel River, which flows to the Pacific); length, about 8 miles. Punnett's map of Humboldt County.

Yaney Canyon Creek; Mono County; rises in the western part of T. 5 N., R. 24 E., Mount Diablo base and meridian, at altitude 8,300 feet above sea level; flows eastward 3 miles into Swager Creek (tributary through Buckeye Creek to East Walker River and thus to Walker River, which discharges to Walker Lake); fall, 1,600 feet; intermittent. Bridgeport sheet.

Yellow Jacket Creek; Trinity County; rises in the northeastern part of T. 35 N., R. 11 W., Mount Diablo base and meridian, flows southwestward 5½ miles into East Fork of North Fork of Trinity River (tributary through Trinity River to Klamath River, which discharges to the Pacific). Punnett's map of Trinity County.

Yreka Creek; Siskiyou County; rises in the northwestern part of T. 44 N., R. 7 W., Mount Diablo base and meridian, on the east slope of Forest Mountain; flows in general northeastward to its junction with Shasta River (tributary to Klamath River, which flows to the Pacific); length, 10 miles; passes through the town of Yreka. Punnett's map of Siskiyou County, on which it is not named; Land Office map of California, 1907.

Yridisis Creek; Santa Barbara County; an intermittent stream, 1 mile long, flowing southward into El Jaro Creek (tributary to Salsipuedes Creek, and thus to Santa Ynez River, which discharges to the Pacific). Lompoc sheet.

Ytias Creek; Santa Barbara County; an intermittent stream flowing southwestward into El Jaro Creek (tributary through Salsipuedes Creek to Santa Ynez River, which discharges to the Pacific) in San Julian Rancho. Lompoc sheet.

Yucaipe Creek; San Bernardino and Riverside counties; rises in the eastern part of T. 1 S., R. 1 W., San Bernardino base and meridian, at altitude 7,500 feet above sea level; flows south of west to its junction with San Timoteo Creek (tributary to Santa Ana River, which discharges to the Pacific Ocean) near Bicknell; length, 14 miles; fall, 6,000 feet, of which 4,700 feet is made in about 6 miles at the head. San Gorgonio and Redlands sheets.

Zaca Lake; Santa Barbara County; a small lake 1 mile northwest of Zaca Peak. The map shows no connection between Zaca Lake and La Zaca Creek, but overflow from the lake must pass through the creek to Santa Ynez River, which discharges to the Pacific Ocean. Lompoc sheet.

Zanja Creek, The; the channel that takes waters from Mill Creek (tributary to Santa Ana River, which discharges to the Pacific), where it courses close to the south hillside of its wide-open lower canyon. This channel was constructed in 1821 and has long lost the semblance of an artificial work. Redlands and San Bernardino sheets; Hall, Irrigation in California [southern], pp. 300–301.

Zayante Creek; Santa Cruz County; rises in the northeastern part of T. 9 S., R. 2 W., Mount Diablo base and meridian, at altitude 1,800 feet above sea level; flows in general west of south about 10 miles to its junction with San Lorenzo River (which discharges to the Pacific Ocean) near Felton; fall, about 1,500 feet; principal tributaries, Lompico and Bean creeks. Santa Cruz sheet.

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GAGING STATIONS.

The following list comprises the gaging stations maintained in the Great Basin and Pacific coast drainage basins in California from 1891 to July 1, 1912. It includes all the stations that have been maintained in California exclusive of those in the Sacramento and San Joaquin drainage basins. The stations are arranged in downstream order, tributaries being indicated by indention. A dash following the date implies that the station was being maintained July 1, 1912.

GREAT BASIN.

Honey Lake basin:
- Susan River near Susanville, 1900–1905.
  - Willow Creek at Merrillville, 1904–5.
  - Willow Creek near Standish, 1900–1905.

Pyramid and Winnemucca Lake basins:
- Lake Tahoe at Tahoe, 1900–
- Truckee River at Tahoe, 1895–96, 1900–
- Truckee River near Nevada-California State line, 1899–
  - Donner Creek near Truckee, 1902–
  - Prosser Creek near Truckee, 1903–4, 1907–
  - Prosser Creek near Boca, 1902–3.
  - Little Truckee River at Starr, 1903–1910.
  - Little Truckee River at Boca, 1911–
    - Independence Creek below Independence, 1902–1907.

Carson Sink basin:
- West Fork of Carson River at Woodfords, 1900–
- East Fork of Carson River at Silver King Valley, 1910–
- East Fork of Carson River near Markleeville, 1910–
  - Silver Creek near Markleeville, 1910–
  - Markleeville Creek near Markleeville, 1911–
  - Markleeville Creek at Markleeville, 1910–
    - Pleasant Valley Creek at Markleeville, 1910–

Walker Lake Basin:
- West Walker River near Coleville, 1902–1908
- East Walker River near Bridgeport, 1911–
  - Robinson Creek near Bridgeport, 1910–
  - Buckeye Creek near Bridgeport, 1910–
    - Swager Creek near Bridgeport, 1911–

Mono Lake basin:
- Rush Creek near Mono Lake, 1910–
- Leevining Creek near Mono Lake, 1910–

Owens Lake basin:
- Owens Lake near Olancha, 1908–
  - Owens River near Round Valley, 1908–
  - Owens River near Tinemaha, 1906–
  - Owens River near Lone Pine, 1908–
  - Owens River near Citrus, 1903–1906.
    - Rock Creek near Round Valley, 1903–
      - Pine Creek near Round Valley, 1908–
    - Bishop Creek near Bishop, 1903–1911.
    - Baker Creek near Big Pine, 1907–1910.
    - Big Pine Creek near Big Pine, 1903–1911.

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Owens Lake basin—Continued.
Owens River—Continued.
Tinemaha Creek near Big Pine (Tinemaha), 1906–1911.
Birch Creek near Big Pine (Tinemaha), 1905–1911.
Taboose Creek near Aberdeen, 1906–1911.
Goodale Creek near Aberdeen, 1906–1911.
Division Creek near Independence, 1906–1911.
Sawmill Creek near Independence, 1906–1910.
Thibaut Creek near Independence, 1907–1909.
Oak Creek near Independence, 1905–1911.
Little Pine Creek near Independence, 1905–1911.
Shepard Creek near Thebe, 1906–1909.
Bairs Creek near Thebe, 1906–1909.
George Creek near Thebe, 1906–1911.
Lone Pine Creek near Lone Pine, 1906–1911.
Tuttle Creek near Lone Pine, 1906–1911.
Cottonwood Creek near Olancha, 1906–1911.
Ash Creek near Lone Pine, 1906–1909.

OWENS RIVER CANALS.

Owens River canal near Bishop, 1903–1905.
Bishop Creek canal near Bishop, 1903–1905.
Farmers canal near Bishop, 1903–1905.
McNalley canal near Bishop, 1903–1905.
George Collins's canal near Bishop, 1903–1905.
Rawson canal near Bishop, 1903–1905.
A. O. Collins's canal near Bishop, 1903–1905.
Dell canal near Bishop, 1903–1905.
Big Pine and Owens River canal near Bishop, 1903–1905.
Sanger canal at Alvord, 1903–1905.
East Side canal near Citrus, 1903–1905.
Stevens canal near Citrus, 1903–1905.
Powers canal near Bishop, 1903–1905.
South Hillside canal near Bishop, 1903–1905.
North Hillside canal near Bishop, 1903–1905.

Mohave Desert:
Mohave River at Victorville, 1899–1906.

Antelope Valley:
Little Rock Creek near Palmdale, 1896–1899.

Salton Sink:
Salton Sea near Salton, 1904–
Alamo River near Brawley, 1908–1912.
New River near Brawley, 1908–1910.

LOWER COLORADO RIVER.

Colorado River at Hardyville, Ariz., 1905–1907.
Colorado River near Mohave, Ariz., 1902–3.
Colorado River at Yuma, Ariz., 1891–

IMPERIAL VALLEY CANALS.

Imperial canal near Yuma, Ariz., 1903–5.
Imperial canal near Calexico, 1904–5.
Holt canal near Calexico, 1904–5.
Hemlock canal near Calexico, 1904–5.
Alamitos canal near Calexico, 1904–5.

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Boundary canal near Calexico, 1904–5.
Wisteria canal near Calexico, 1905.

SOUTH PACIFIC COAST DRAINAGE BASINS.

Tia Juana River basin:
Cottonwood Creek and Dulzura conduit near Jamul, 1905–
Pine Valley Creek near Jamul, 1906–1908.
Sweetwater River basin:
Sweetwater River near Descanso, 1905–
San Diego River basin:
San Diego River and canal near Lakeside, 1905–
San Dieguito River basin:
Santa Ysabel Creek (head of San Dieguito River) near Escondido, 1905–
Santa Ysabel Creek near Ramona, 1912–
San Dieguito River at Bernardo, 1911–
San Luis Rey River basin:
San Luis Rey River at diversion flume, 1894–1899.
San Luis Rey River near Mesa Grande, 1911–
San Luis Rey River near Pala, 1903–
San Luis Rey River at Bonsall, 1912–
Santa Margarita River basin:
Temecula Creek (head of Santa Margarita River) near Temecula, 1905–6.
Santa Ana River basin:
Santa Ana River and power canal near Mentone, 1896–
Waterman Canyon Creek (West Twin Creek) near San Bernardino, 191–
Devil Canyon Creek near San Bernardino, 1911–
San Gabriel River basin:
San Gabriel River and power canal near Azusa, 1895–
Los Angeles River basin:
Arroyo Seco near Pasadena, 1910–
Malibu Creek basin:
Malibu Creek near Calabasas, 1903–1906.
Triunfo Creek near Calabasas, 1903–1906.
Santa Clara River basin:
Santa Clara River at Fillmore, 1911–
Piru Creek near Piru, 1911–
Sespe Creek near Sespe, 1911–
Santa Paula Creek near Santa Paula, 1911–
Ventura River basin:
Ventura River near Nordhoff, 1911–
Ventura River near Ventura, 1911–
Santa Ynez River basin:
Santa Ynez River near Santa Barbara, 1903–
Santa Ynez River near Lompoc, 1906–
Mono Creek at Mono dam site, 1902–1904.
Santa Maria River basin:
Santa Maria River near Santa Maria, 1903–1906.
Salinas River basin:
Salinas River near Salinas, 1900–1901.
Nacimiento Creek near Bryson, 1901.
San Antonio River near Jolon, 1900–1901.
San Lorenzo Creek near King City, 1900–1903, 1912–
Arroyo Seco near Soledad, 1900–
Pajaro River basin:
Pajaro River at Watsonville, 1911–

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NORTH PACIFIC COAST DRAINAGE BASINS.

Russian River basin:
- Russian River at Ukiah, 1911–
- Russian River at Geyserville, 1910–
  - East Fork of Russian River near Ukiah, 1911–

Mattole River basin:
- Mattole River near Petrolia, 1911.

Eel River basin:
- South Eel River (head of Eel River) at Hearst, 1910–
- Eel River near Laytonville, 1911–
- Eel River at Scotia, 1910–
  - Middle Eel River near Covelo, 1911–
  - South Fork of Eel River at Garberville, 1911–
  - Van Duzen River at Bridgeville, 1911–
    - Yager Creek at Carlotta, 1911–

Mad River basin:
- Mad River near Arcata, 1910–

Redwood Creek basin:
- Redwood Creek near Korbel, 1911–
- Redwood Creek at Orick, 1911–

Klamath River basin:
- Klamath River near Happy Camp, 1911–
- Klamath River near Requa, 1910–
  - Lost River near Clear Lake, 1904–1909.
  - Shasta River near Montague, 1911–
  - East Fork of Scott River (head of Scott River) near Callahan, 1910–
  - Scott River near Scott Bar, 1911–
  - Indian Creek near Happy Camp, 1911–
    - Reeve Davis Consolidated Mining Co.'s ditch near Happy Camp, 1911–
  - Salmon River near Somesbar, 1911–
  - Trinity River near Trinity Center, 1910–
  - Trinity River at Lewiston, 1910–
  - Trinity River near China Flat, 1911–
  - Trinity River at Hoopa, 1911–
    - Coffee Creek at Coffee, 1910–
    - East Fork of Trinity River near Trinity Center, 1910–
    - Swift Creek near Trinity Center, 1910–
    - North Fork of Trinity River at Helena, 1911–
    - South Fork of Trinity River near China Flat, 1911–

Smith River basin:
- Middle Fork of Smith River near Crescent City, 1911–
  - North Fork of Smith River (head of Smith River) near Crescent City, 1911–
  - South Fork of Smith River near Crescent City, 1911–

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